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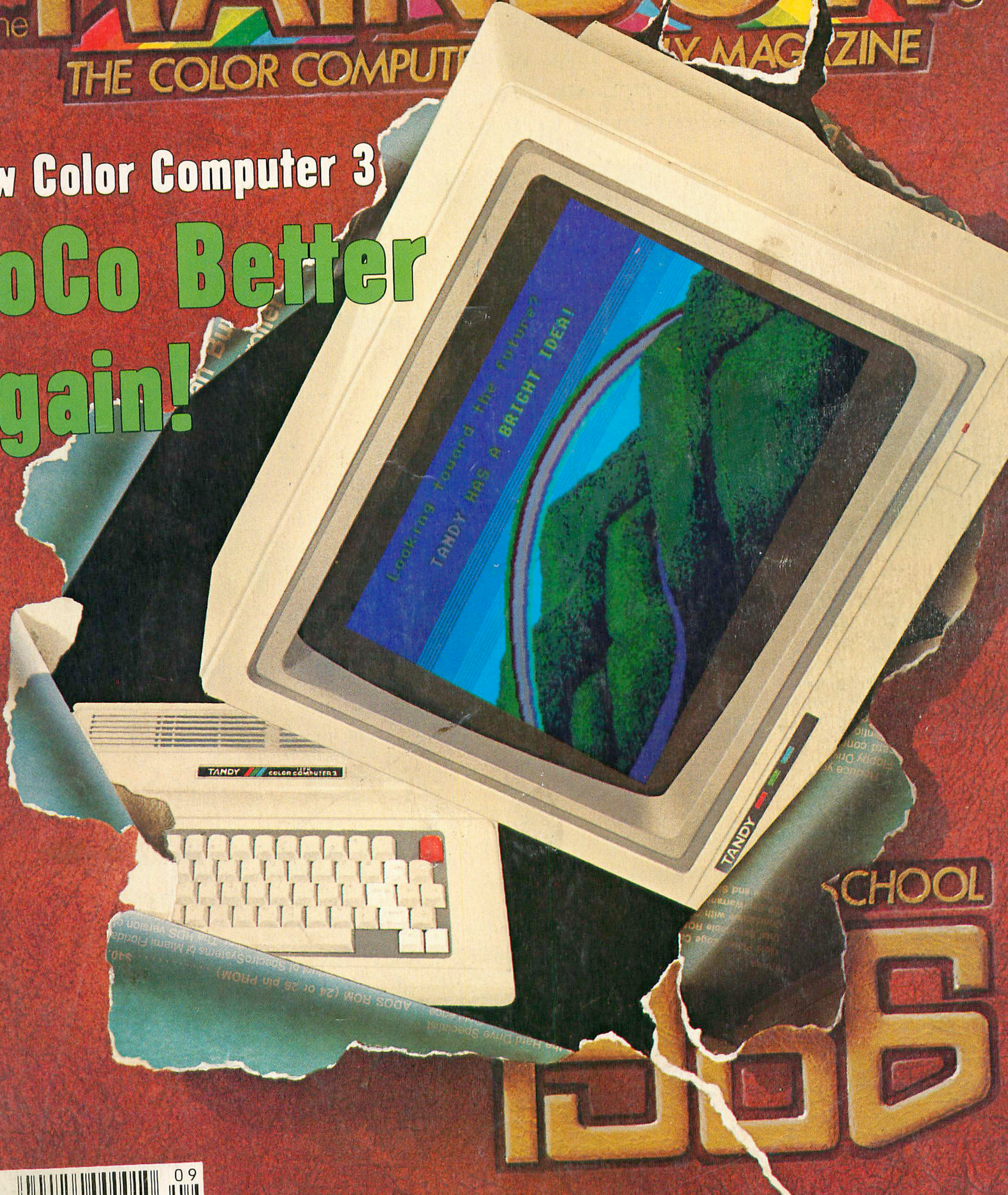
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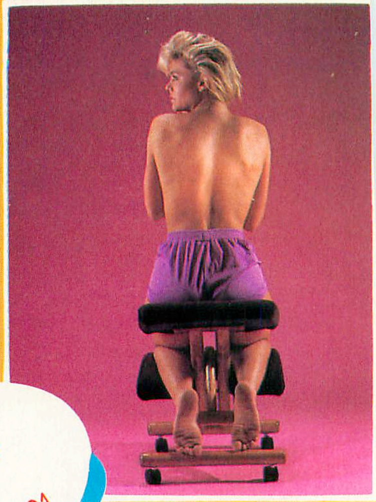

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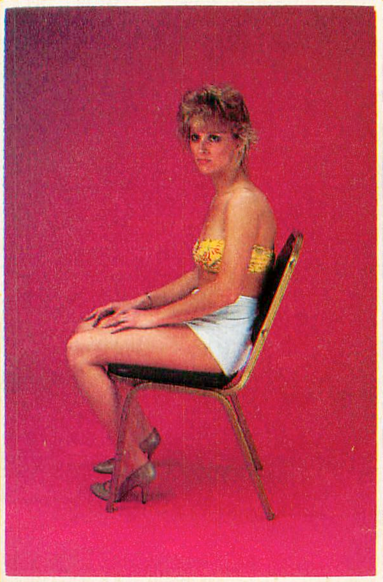

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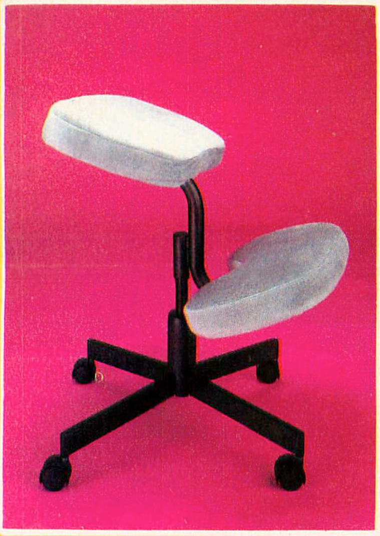

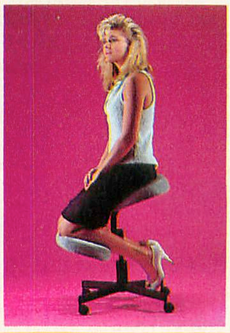

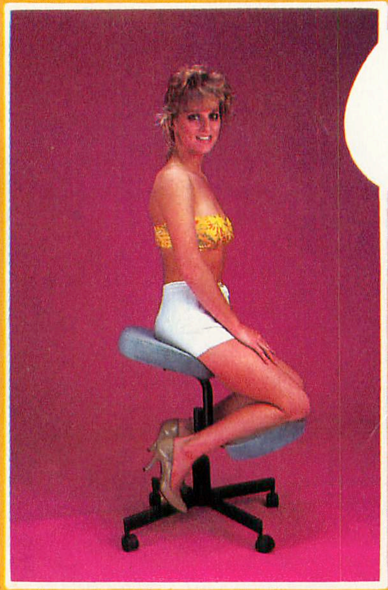

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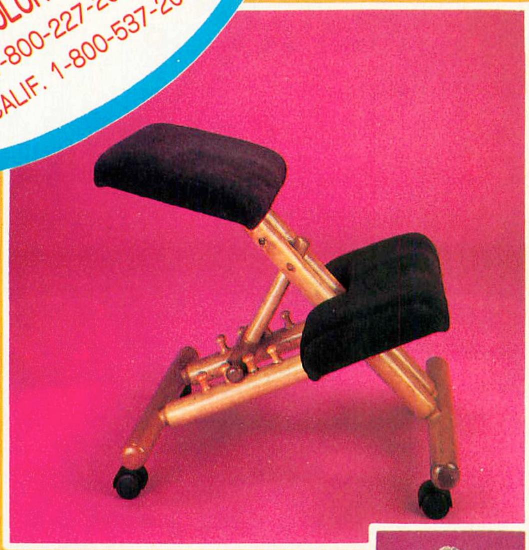

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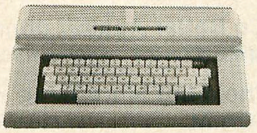

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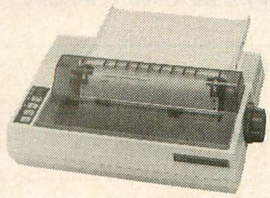

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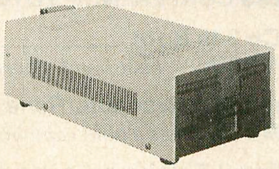

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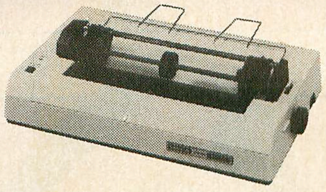

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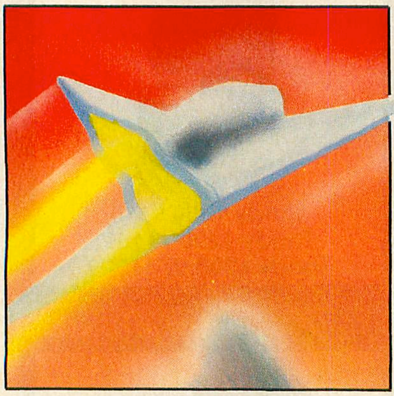

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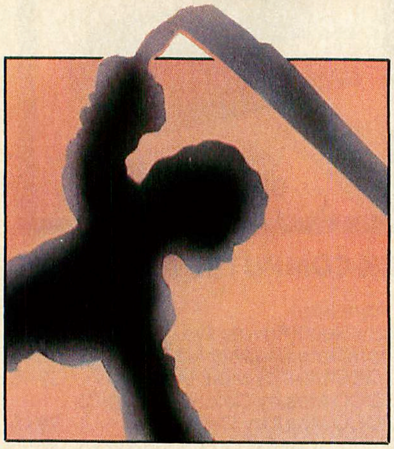

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📼 The small cassette tape symbols beside features and regular columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE, ready to CLOAD and RUN. For full details, check our RAINBOW ON TAPE ad on Page 147.

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NEXT MONTH: The crisp, vibrant colors of autumn find their way onto the pages of THE RAINBOW in October's Graphics issue. Nature's dazzling display is reflected in our many interesting and colorful programs sure to delight even the most discerning art critic. On your tour, be sure to stop by the "CoCo Gallery" and check out works by the newest artists. And don't forget our many games, columns, applications and tutorials just for your CoCo.

Get in on the harvest of good things — get THE RAINBOW, the number one information source for the Color Computer!

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September 1986 Vol. VI No. 2

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LETTERS TO THE RAINBOW

Wild Blue Yonder

Editor:

My full-time occupation is music teacher in a public middle school. In addition, I stay after school to supervise a computer/aviation club. We use the Color Computer to learn basic flight theory and to model aircraft behavior, with *Worlds of Flight, F-16, P-51* and *Flight Simulator* to teach the basics of approach and landing. *Approach Control* is used when we discuss air traffic control to show the other side of the coin. This club evolved from the interest that the students had in my involvement in learning to fly and seeing me work with the Tom Mix simulator. It became a great challenge to my students. Seeing their interest sparked me to get my Basic Ground Instructor Certification.

Mike Kello
Nesquehoning, PA

BACK TALK

Editor:

Just when I was about to give up on practical application programming because of negative responses to *Cash vs. Financing* (March 1986, Page 71), a letter came restoring my self-confidence. Thanks to RAINBOW readers like Steve Lente I'm again active and willing to branch out into unfamiliar areas. Like he says, if I don't branch out, life will get awfully boring, and I might overlook an area where I could eventually excel.

Bill Bernico
Sheboygan, WI

Cadprint on the DMP-105

Editor:

I would like to respond to a letter by R.W. Harper [June 1986, Page 8] about a problem getting the *Cadprint* modification program (February 1986, Page 103) to work on the DMP-105 printer. Here are the changes needed for proper operation:

```
40 POKE150,18:'2400 BAUD
60 FORPG=0TO2
80 LOADM"PRT.PG"+RIGHT$(STR$(PG
   +3),1),&H4200
90 LOADM"PRT.PG"+RIGHT$(STR$(PG
   +6),1),&H5A00
110 KILL"PRT.PG"+RIGHT$(STR$(PG),
    1):KILL"PRT.PG"+RIGHT$(STR$(P
    G+3),1):KILL"PRT.PG"+RIGHT$(S
    TR$(PG+6),1):NEXTPG
```

The original program loaded pages 0, 1, 2 then 3, 4, 5 then 6, 7, 8 for printout which made the picture come out all wrong. With these changes, the program loads pages 0, 3, 6, then 1, 4, 7 and finally 2, 5, 8 for proper printout.

Has anybody figured out how to get *DeskMate* for OS-9 to work at 2400 Baud? The DMP-105 only works at 600 or 2400 Baud rates. It is a hassle to change the DIP switch on the printer every time I want to use *DeskMate* to write a letter.

I can be reached at 12950 El Rio Road, 92392.

E.C. Blend, Jr.
Victorville, CA

HINTS AND TIPS

Editor:

Here's a quick change for those who have *CoCo Max* and want to use their Hi-Res Output Module with *CoCoCad*, featured on Page 130 of the October 1985 issue. Maybe others are tired of unplugging and replugging their mouse too. Change Line 20 and add Line 25 as follows.

```
20 PQR=PEEK(&HFF90):Y=PEEK(&HFF91
   ):X=PEEK(&HFF92):P=PEEK(&HFF93
   ):IF X<3 THEN X=3 ELSE IF X>252
   THEN X=252
25 IF P<50 THEN P=3
```

If anyone knows of a screen dump for the Okidata Microline 92, please drop me a line. It would be greatly appreciated. My address is 5522 West John Cabot Road, 85308.

Tim Fadden
Glendale, AZ

See "Putting The Okidata ML92 To Work" by Joseph Kohn on Page 89 of the May 1985 issue.

The *CoCo Max* Connection

Editor:

A short time after getting *CoCo Max*, I wished I could take the BASIC program I spent so much time drawing using BASIC commands, and put that picture into *CoCo Max* to improve and rearrange it. Here is the procedure I developed that enables me to do it.

Run the BASIC program, and when it's completely drawn on the screen press the BREAK key. Type in uppercase letters the name of the program only (dark-colored letters) `SAVEM"NAME/EXT",&HE00,&H25FF,&HE00`. This saves the screen to disk.

For *CoCo Max* use the extension MAX; for *Graphicom* use the extension BIN. Then run *CoCo Max* or *Graphicom* and load in your newly saved screen. Do what you want with it and resave it to disk. Questions can be directed to me at 39 Haven Avenue, 01013. Enclose an SASE please.

James R. Demers
Chicopee, MA

Are You There?

Editor:

Information as to whether or not the printer is on (assuming your printer sends a busy signal when not ready) is contained in memory location 65314. The value in this location is five when printer is not ready and four (usually) when ready.

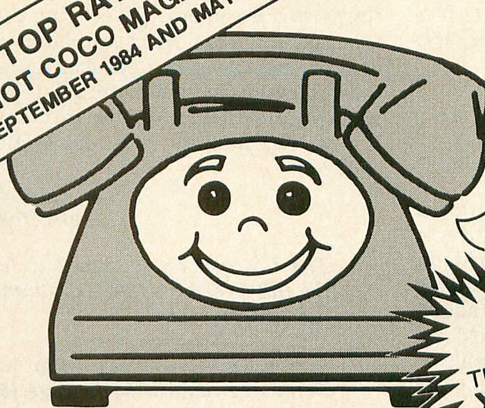
I have designed this subroutine to incorporate in my programs using the printer:

```
10 CLS
20 IFPEEK(65314)< >5THEN50
30 PRINT@0,"PRINTER IS NOT READY"
40 GOTO10
50 RETURN
```

This subroutine can be used instead of the usual instruction to "get the printer ready."

Jules E. Lafrance
Nepean, Ontario

TOP RATINGS
HOT COCO MAGAZINE
SEPTEMBER 1984 AND MAY 1985



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Parker, *HOT CoCo*, 5/85

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A Simpler Way

Editor:

This is in response to Marty Goodman's "Lap Keyboard" article [July 1986, Page 71]. He described a procedure for connecting ribbon cable to the plastic ribbon connector. I found the simplest and cheapest method is to take a 40-pin IC socket (preferably one with flat pins) and cut the two pin strips from the socket frame, remove the pins and carefully saw or cut away the plastic dividers between the pin holes on one of the IC strips. Replace the pins on this one modified strip and you should be able to plug the keyboard plastic ribbon into the new connector. Solder the connecting cable to the pin ends.

At the other end of the extension cable, solder on the individual pins (female end) to the end of the cable wires and carefully put the pins back into the remaining IC strip. Plug the finished connector into the plastic ribbon socket on the computer board (CoCo 'F' board and CoCo 2) and that's it!

Rodger Alexander
Bellingham, WA

REQUEST HOTLINE

Editor:

I am interested in finding someone who has a DMP-110 printer and the program *Hardcopy*. I have made several banners and greeting cards using the program and would very much like to exchange data disks. Anyone interested, please write to me at 88 Steinmetz Road, 08502.

Scott Enman
Belle-Mead, NJ

Habla Francais

Editor:

I am looking for a program (tape or disk) to help me in learning French and Spanish. Send any information to 1059 E. 6th Avenue, 85204.

Arthur H. Packard
Mesa, AZ

CoCo, Par 2

Editor:

I own a CoCo 2 and am looking for a program to store and calculate golf handicaps, on cassette only. My address is 982 Holman Way, 89431.

Ted Tuso
Sparks, NV

> *Please read the review of* Golf Handicaps *on Page 215 of the August 1985 issue.*

Pot O' Gold

Editor:

I am attempting to complete my library of RAINBOW issues for 1983 and 1984. If any readers would be willing to sell me their copies of the January, February, March and May issues for 1983 or the January and February issues from 1984, please write to me at 905 Remington Drive, 65202. Reasonable offers considered.

Kerry L. Nye
Columbia, MO

DELPHI LINE

Editor:

The Electronic Call Board is celebrating its one-year anniversary with the addition of a 1200 Baud Hayes and 128K of RAM. In our first year we have approached 8,000 calls and 3,000 messages. Now that we've added the new modem and additional RAM we expect that number to more than double in the coming year. To reach us, put your settings on 1200/300, E, 7, 1 and let 'er rip. Call NYC's first 128K CoCo BBS!

Bobby Ballard
(BOBBYBALLARD)
Brooklyn, NY

A Pat on the Back

Editor:

I enjoy your excellent magazine and join many others in praising its overall quality. I have learned a great deal, and the fact that you are the sole survivor in the CoCo world is testimony that you're doing things right. I have two suggestions to further improve the educational value of THE RAINBOW.

Refrain from publishing programs that consist only of machine language `DATA` statements read and `POKE`d by a BASIC program. Each machine language program should be accompanied by the source code, if readers are to gain any value from the article.

Although I am a subscriber to RAINBOW ON TAPE, I think you are doing your readers a disservice by not publishing any program listing for an article, such as was done with *MUSIC+*, (by Bob Ludlum in June 1986). This is an excellent program, and should not be limited to subscribers of RAINBOW ON TAPE. Otherwise, keep up the superb work!

Chris Bergerson
(CHRISB)
Williamsville, NY

INFORMATION PLEASE

Editor:

Having recently acquired a CoCo 2 with 64K, I am trying to make full use of it. I am using cassette. I have purchased a copy of *Telewriter* and find it to be a very suitable word processor. I have also written some BASIC programs.

I would like to be able to use the full 64K (instead of just the standard 32K) with my BASIC programs, but do not know how to do so. I feel sure that you have published an article on how to do this, but I do not know what month to look in. Could you advise me?

A friend told me you published an article on increasing the CoCo's memory above 64K, but could not remember the issue. Could you tell me what issue to look in?

Telewriter has three features I find helpful: saving files in binary; verifying a save on tape and auto retry when searching for a file or verifying. Have you published any articles on achieving these functions? I want to incorporate these features into my programs. My address is Route 4, Box 90, 47122.

Dave Hottell
Georgetown, IN

> *The CoCo is not designed to use the full 64K for BASIC. It can only use 32K at a time.*
>
> *See "128K — The Easy Way" by Dennis Lewandowski on Page 162 in the December 1984 issue.*

The Heart of the Matter

Editor:

I am trying to fix a 64K Extended BASIC CoCo 2, red tag special. I would like to see an article showing the guts and their workings plus a few test tricks for repairs.

Fred Wise
Clarion, PA

> *See "An Introduction To The Inside Of The CoCo 2" by Tony DiStefano on Page 68 of the January 1985 issue. Also look at the "Index to Rainbow" July 1984, 1985 and 1986 issues for articles by Tony DiStefano. These will be most helpful.*

Mayday! Mayday!

Editor:

If someone has a copy of the superpatched *EDTASM+* working on a 64K CoCo 2 with Disk BASIC 1.1, please contact me at 6321 Bosker Lane, 48444. I can't get it to work right with my computer and I'm not good enough in assembly language to fix it.

John Gormely
Imlay City, MI

No Assembler Please

Editor:

I am writing to request a BASIC program to write machine language programs without an assembler.

Zack Shelley
Casper, WY

> *Please see "Machine Code Loader" by Dennis Weide on Page 144 in the July 1985 issue.*

Nonexistent OS-9 Errors

Editor:

I'm just getting into OS-9 and sometimes it gives me error messages I can't find in the manual. Where can I get a list or book of all the error codes?

I have a 32K 'E' board that I upgraded to 64K. The upgrade did not include cutting and removing any parts. A number of programs don't seem to recognize it as 64K, *VIP Writer* for one. *Ghana Bwana* tells me

I have a bad byte in my 32K, and I have no sound. If I type in RUN "*" the second time, the game runs, but still no sound. Help, please! My address is Box 1132, V9Y 7L9.

Dave Read
Port Albern, British Columbia

Read "RAM/ROM Upgrade Roundup" on Page 49 of the May 1984 issue.

Transfer Troubles

Editor:

I go to Radio Shack once in a while to check out the educational programs on sale for my kids. Usually the programs are cassettes, and I have a disk system. I tried a popular copy program to copy tape to disk but it doesn't do the job. What can I do to get these tapes on disk?

S. Brett Healey
Logan, UT

Try Roger Schrag's "A Tape To Disk Transfer Vehicle" on Page 48 in the January 1984 issue.

BOUQUETS AND BRICKBATS

Editor:

In the November 1985 RAINBOW, INFOCOM placed an advertisement (pages 10-11) for their *Four In One Infocom Sampler*, which I ordered. Many weeks later I received a letter from INFOCOM saying that they were backordered and to be patient. Several weeks after the letter I received the *Sampler* disk only to find that it would not load or operate. After a phone call to INFOCOM, I sent the disk to their technical department and asked for replacement. Several weeks later a new disk arrived, with the same problems. I returned this disk and stated the difficulties I had. I explained that I would still be interested in their program if problems could be corrected.

Michael Garozzo
Morrisville, PA

Four In One Solution

Editor:

I appreciate your bringing Mr. Garozzo's letter to our attention. The technical loading problem of the *Four In One Infocom Sampler* is one which we discovered subsequent to Mr. Garozzo sending his disk. It is encountered only by original CoCo owners (Version 1.0 Extended BASIC) who need to enter the BASIC program shown below as explained in the CoCo owners manual. Those with Version 1.1 will not encounter this problem.

Customer satisfaction is extremely important to each of us at Infocom. We welcome feedback which helps us improve our service and the quality of our products. Hopefully this technical information will assist other CoCo users.

To run the game, be sure to type:

```
>DOS
```

If you have Version 1.0 Extended BASIC, you need to type in the following program in order to run the game.

```
40 FOR I=0 TO 70
50 READ A$
60 POKE &H5000+I,VAL("&H"+A$)
70 NEXT I
80 CLS:PRINT "INSERT STORY
   DISKETTE"
90 PRINT "INTO DRIVE 0 AND PRESS
   A KEY"
100 A$=INKEY$:IF A$=""THEN 100
110 EXEC &H5000
120 DATA 86,22,8E,26,00,8D,0D
130 DATA FC,26,00,10,83,4F,53
140 DATA 26,03,7E,26,02,39,34
150 DATA 20,10,BE,C0,06,A7,22
160 DATA 86,02,A7,A4,6F,21,6F
170 DATA 23,6C,23,AF,24,10,BE
180 DATA C0,06,A6,23,81,13,27
190 DATA 12,AD,9F,C0,04,4D,27
200 DATA 06,6C,23,6C,24,20,E9
210 DATA 7F,FF,40,35,A0,4F,20
220 DATA F8
```

Under BASIC's "OK" prompt, type RUN and press ENTER. You should save this to a BASIC format disk for future use. Note: Do not save this program to your Infocom Diskette.

Dorene B. Woodrow
INFOCOM
Cambridge, MA

hi-tech Compliments

Editor:

I would like to compliment one of your new advertisers — hi-tech Stationery. After seeing their ad in the June 1986 RAINBOW, I sent for the brochure and free sample of stationery. Within a week I had received the promised items. A lot of mail order stationery companies send a catalog with pictures of the stationery. Not hi-tech. They sent actual full-size samples of the stationery. Needless to say, I was impressed. Will I order from them? You bet! Quality magazines such as yours will continue to attract the best of these advertisers.

Jill Mead
Lansing, MI

Faster Than a Speeding CoCo

Editor:

I just had to write concerning the speed with which one of your advertisers, Derringer Software of South Carolina, responded. On June 9, in the July 1986 issue, I found their interesting *Max Fonts* ad on Page 94. I called at noon requesting they send me all three sets. I was told they would be mailed the next day. Today is June 11 and the mailman just delivered them to me.

I would like to thank RAINBOW magazine for all the help it gives; I am far from being an expert, but with your help, I have a very good hobby.

George Levka
Chicago, IL

Above and Beyond

Editor:

HJL Products, a division of Touchstone Technology Inc., deserves special recognition for customer concern to match their excellent keyboard. Though it was well beyond the warranty period and it took two tries, they put me back in business with a working HJL keyboard at no charge.

Gerry Odell Wood
Los Alamos, NM

KUDOS

Editor:

I just received the July 1986 issue of THE RAINBOW and wanted to tell you how much I enjoyed "The Faces of Falsoft: the Rainbow Makers" (Page 37). It was just great. Thanks!

I would like to suggest that you consider including pictures of the authors, in addition to the biographical data that accompanies each article.

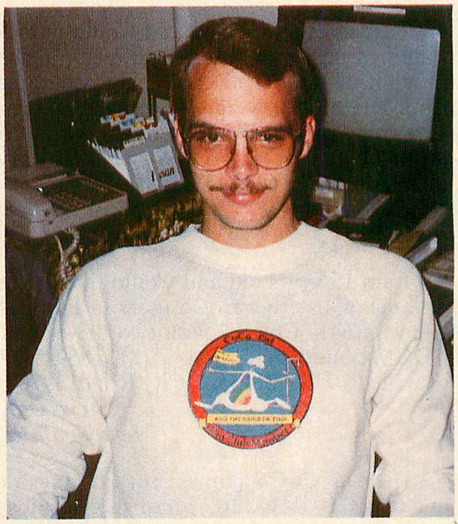
Mike Rozek
Winona, MN

CoCo Cat Art

Editor:

This is my version of how our CoCo Cat should be colored. Thanks for providing the iron-on. Great idea!

David Reneer
Novato, CA



BBSers Sought

Editor:

The CoCo Communications newsletter still needs users! This newsletter deals with CoCo telecommunications with a list every other month of BBSs around the world. There are reviews on BBS programs, terminal programs, modems and other software. There's also a mailbag to ask questions or leave your BBS number, or just to have a modem pal! To get this newsletter, send $2 to 301 Caravel Drive, 19701.

Steve Slack
Bear, DE

A Job Well Done

Editor:

In your January 1986 issue [Page 88], you had a program by Mary and James Lamonica called *CoCo Math Class*. I typed in this program for my wife — she has a slight learning disability — but she could not use it. In order to use it she had to write the problem then enter the answer.

I contacted the Lamonicas with this problem to see what I could do about straight entry of the answer. Two days later Mr. Lamonica *called* me. He had modified the program and was sending the updated copy to me.

I feel the Lamonicas deserve a large round of applause and, from me, many thanks. I would like to see more of their work in THE RAINBOW — I feel everyone will benefit from their knowledge and help.

Richard Mullicane
Rancho Cordova, CA

PEN PALS

Editor:

I am 15 years old and looking for a pen pal. I have a 64K CoCo 2, two disk drives and a cassette recorder. I have a lot of games, pokes and some Adventure games. Write to me at 2070 62nd Street North, 33520.

Dino Sanchez
Clearwater, FL

- I am a retired person and would appreciate hearing from another retiree with the thought of mutual help in using programs from THE RAINBOW and in elementary programming on my 64K CoCo. I have a #10 printer and tape recorder — no disk. My address is Box 342, 32735.

Flora Swingle
Grand Island, FL

- I am 15 years old and would like to get in touch with other CoCo users in Florida. I have a 64K CoCo 2 with two drives and a DCM-5 modem. Call me at (813) 859-2629 or write to 1109 Old Polk City Road, 33809.

Steve Dale
Lakeland, FL

- I am a CoCo games nut. It doesn't matter if it is BASIC, binary, graphics, Adventures, etc. — I just love games. I'm looking for pen pals. Contact me at 5753 S. Laflin, 60636 or phone (312) 737-5716 from 6-8 p.m. Mon.-Fri. or 12-8 p.m. Sat. and Sun.

Kevin Adair
Chicago, IL

- I am 15 years old, own a 64K CoCo 2, cassette drive and a Centronics model 308 printer. I would like a pen pal with the same or a close setup. My main interests are Adventure games and programs for my printer. My address is P.O. Box 56, 67103.

Brian Daily
Mayfield, KS

- I am 11 years old and would like to have a pen pal around my age. I have a 64K ECB CoCo with disk drive. My address is 1204 Tara Lane, 63303.

Bradley Calise
St. Charles, MO

- Anyone wishing to have a pen pal in the U.S. or abroad, please mail in your name, address and, if you like, some of the things you are interested in. I will, in turn, mail a list back to you. Send to 847 Rosewood Terrace, 13760.

Christopher Smith
Endwell, NY

- I am 11 years old and would like a pen pal. I have a 64K CoCo 2 with one disk drive and cassette deck. Send letters to 33 Scenic Pt. Drive, 12941.

David Endersbee
Jay, NY

- I am looking for a Color Computer pen pal. Write me at 82 Hayes Street, 11762.

Chris Romance
Massapequa Park, NY

- Looking for pen pals. Send correspondence to 24 Parkmere Road, 14617-1912.

Herbert E. Crumrine
Rochester, NY

- I am interested in starting a computer pen pal service. Please send type of computer, disk drive or cassette and printer type to RD #2, Box 252, 18222.

Wesley Laubach
Drums, PA

- Any CoCo 2 owner with a Radio Shack modem having a 300 Baud rate please contact me and be a pen pal. I am looking mostly for pen pals in Pennsylvania. Write me at 3107 Tanker Street, 19145.

Jesse Mosley
Philadelphia, PA

- Anyone looking for a pen pal can write to me. My address is 1369 Miles Drive, 29407.

Raleigh Rivers
Charleston, SC

- I would like a CoCo pen pal from Dekalb county who has a TRS-80 CoCo. Write me at RR 2, Box 90, 37095.

June Elliot
Liberty, TN

- I am looking for a CoCo pen pal to share ideas with and chat with via U.S. mail. My address is P.O. Box 26689, 76126.

Chris Young
Benbrook, TX

- I am 14 years old and own a 64K CoCo system. I would like to have some pen pals. Write to me at 6118 83rd Ct. E, 98371.

Chris Nitz
Puyallup, WA

- I would like some pen pals. My address is 920 North 16th Street, 53081.

Todd Preder
Sheboygan, WI

- I am 15 years old and a new CoCo 2 owner. I would like pen pals from anywhere around the world. My computer is 16K with a cassette recorder which I plan to expand to 64K ECB soon. My address is 6492 Riesch Road, 53095.

Amy Mills
West Bend, WI

- I would like a pen pal. I am 16 years old and own a CoCo 2 with a disk drive and printer.

B. Florence
30 Robinson Street
Croydon, New South Wales
Australia 2208

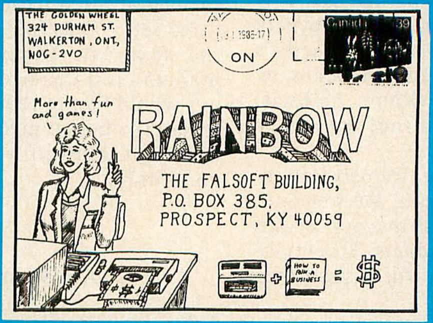
- I live in the suburbs of Paris and am a Tandy TRS-80 32K Color Computer user with diskette adapter and cassette reader. I would like to correspond with other CoCo users.

Dombret Philippe
5 Val De L'eperon
78570 Andresy
France

THE RAINBOW welcomes letters to the editors. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or space.

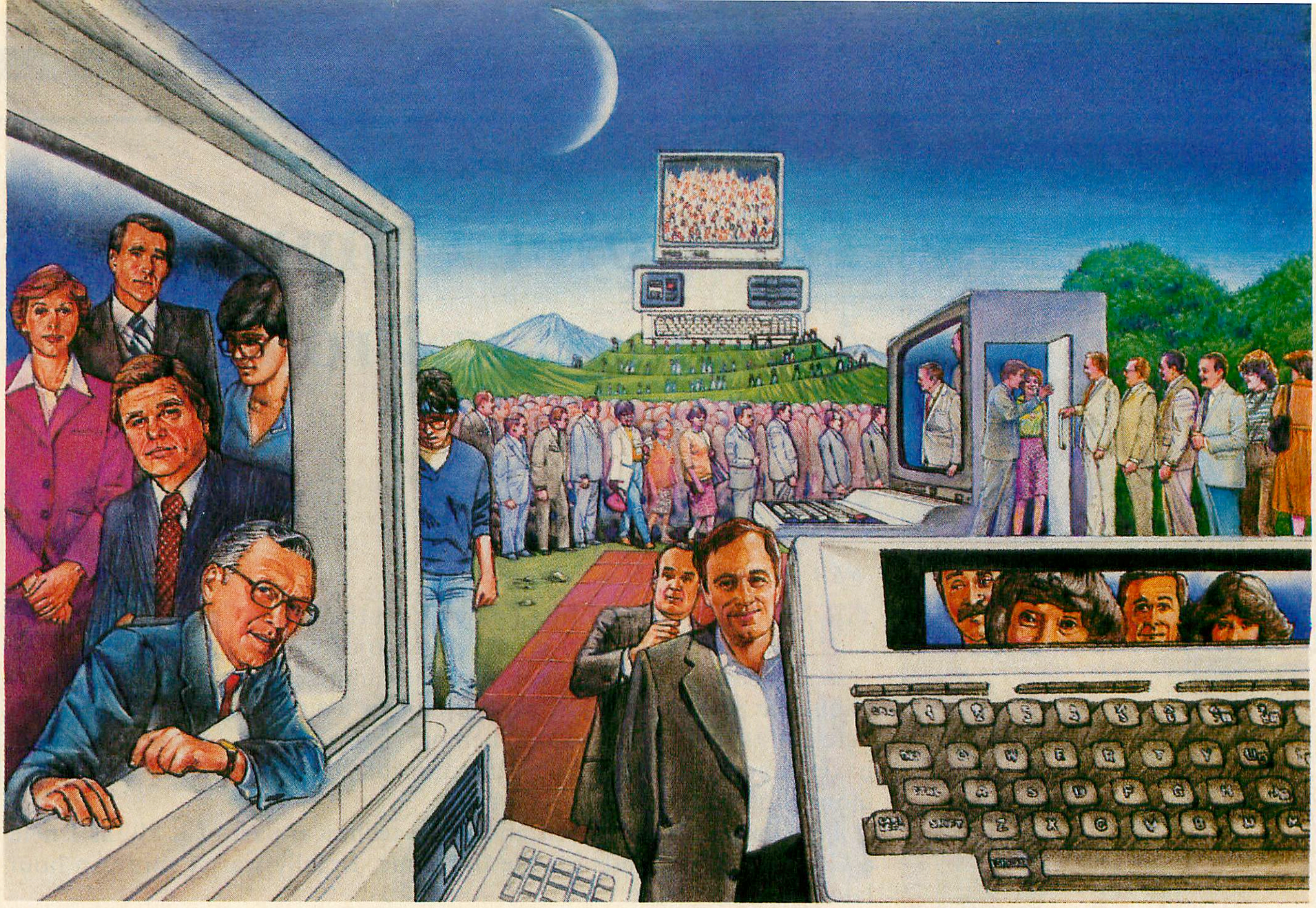
Letters to the editors may also be sent to us through the MAIL section of our Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type `SEND` **and address to:** `EDITORS`**. Be sure to include your complete name and address.**

ARTS AND LETTERS



Envelope of the Month

The Golden Wheel
Walkerton, Ontario



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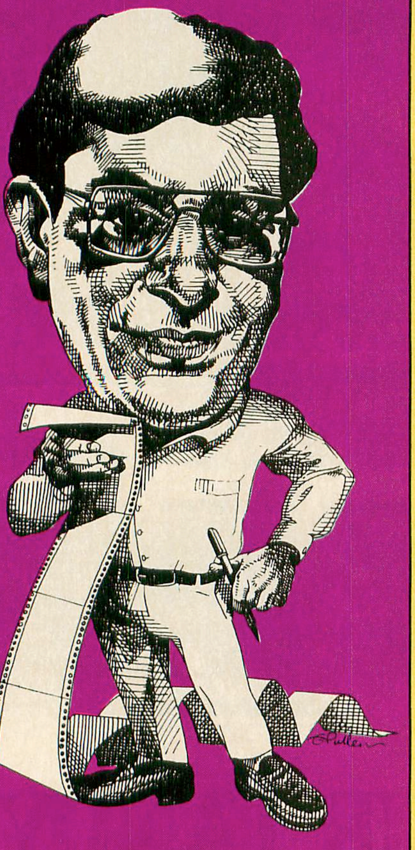

The Color Computer 3: An Amazing Product Well Worth the Wait

NEW YORK, JULY 30 —

The night before I first laid eyes on the Color Computer 3, I kept wondering whether it was going to be worth the wait.

For more than a year now, the rumors have been hot and heavy about the new CoCo and I was hoping we wouldn't see just an upgrade here and there — a little more memory, a few more colors — that would have to come under the classification of "nice" but hardly worth the months of waiting and speculation.

The next day, as I heard about the technical part of it all, as I held a CoCo 3 in my hands for the first time, I really wasn't sure. An hour later I was *very* sure.

In that hour, I watched a CoCo 3 in action. First came a demonstration (which, as a very nice touch if you ask me, features a rainbow in it) that absolutely blew me away. Then came disks with some programs — in BASIC, in machine language and written under OS-9. None of them was commercial stuff, just things that people at Tandy had been tinkering with.

Oh, wow!

I then spoke with one of the outside vendors who has been developing some programs for the new machine. If anything, veteran programmer Greg Zumwalt is even more enthusiastic than I am. "The things I can do with this are really amazing," he told me.

I saw a demo that easily rivals, and in many instances surpasses, Atari's ST and Commodore's Amiga. I heard about a windowing environment that absolutely blows Macintosh away. I saw speed, animation, graphics and colors, screen displays, plus upper- and lowercase (and foreign!) character sets. The list goes on.

The standard that has been used to compare the newer non-IBM computers has been the "bouncing ball demo." Amiga started it with a ball that bounces around the screen, demonstrating graphics and animation. Atari commissioned someone to do one for them to prove they could do it better. Which one actually *is* better is a matter of debate. But CoCo 3's demonstration program does many things and a bouncing ball is just one them. You know, the ball bounces faster and more smoothly on the CoCo 3.

So what? Well, that's not the heart of the CoCo 3 demo. What blows you away is watching the sun rise over a landscape while the shadows and definition of the hills and valleys change and brighten as the sun moves higher in the sky. And then a color-changing rainbow. Beautiful! Go see it at your Radio Shack store.

When the Color Computer was first introduced five years ago, it was something new, special and different. Even today it can do things that far more costly machines cannot. The people at Tandy decided more

Computerware's OS-9 Library

Advanced Utilities

by Brian Lantz

This set is designed for the advanced OS-9 user who wants serious tools. **KSHELL** totally transforms your system by allowing **wildcards** with any utility. The PATH command sets up multiple path directories to be searched when a command is given. UNLOAD is a repetitive unlink utility to remove modules. FLINK allows you to have many different boot files on a given disk & set which one to boot from next time. ARCHIVE backs up large disk media onto small disk media. CPY copies multiple files to a given directory.

$29.95

Sourcerer

by Frank Delargy

The Sourcerer is a menu driven **symbolic 6809 disassembler** that produces symbolic source code that can be assembled. It is compatible with most editor/assemblers that produce ASCII files.

$39.95

Raid

by Chris Bone

RAID is a screen oriented **debugger** with a built in disassembler, single step capabilities, memory window and access to the OS—9 shell. It even has a built in hexidecimal calculator! These are commands to modify the register, locate any module in physical memory, edit memory, set and kill break points, do selective disassemblies, execute modules by name or position, run shell commands, set offsets, single step from the program counter through the code, view the graphic screen, and much more!

$39.95

OS-9 BASIC

Enjoy programming under OS-9 without the struggle of assembly language. This is a full-featured, easy to use, high level language for OS-9 users. Since you can invoke OS-9 commands from within a program, you can write many of those needed utilities with BASIC. Extraordinary file handling capabilities for fast data access and a very efficient file design. BASIC also features 9 & 11 digits of precision using BCD arithmetic, flexible user input commands for conversational programming, and easy output formatting.

$49.95

Disk Fix

by Harry Hardy

Unleash the real power of OS-9. Disk Fix supports true **double-sided/double density, 40 tracks**, and step rates of up to 6 ms and each drive is separately configurable. (CCDISK included) DMODE allows super easy modification of drive descriptors. DIRCOPY is the most powerful of OS-9 copy utilities. PATCH is a user-friendly program for inspecting and modifying a disk file. FILELOOK displays file modules without loading them into memory. COMPARE compares a disk file to memory.

$34.95

The Last Word

by Michael Bailey

This OS-9 word processor offers fast, on-screen formatting using your choice of mouse, joystick, or keyboard. The popdown menu is accessible at all times while inputting text so it is easy to use. You can move, insert or delete blocks of text with one touch.

$49.95

ALSO AVAILABLE:
TEXTOOLS, COLOR CONNECTION II, ADVANCED EDITOR, & MACRO ASSEMBLER

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CoCo Cookbook

by Norman Manchevsky

This is more than a recipe index, it's a true **free format data base**! Designed to store and retrieve a large number of recipes, each can use up to 3040 characters with title, ingredients, and instructions. The powerful **keyword search** lets you find entries with any special word, or ingredient. Over 200 recipes are included to get you started. Organize your VCR tapes, music collection, real estate, each title and description stored for easy retrieval. You don't have to be a chef to appreciate the power of this system.

Requires 32K **Disk $32.95**

Merge 'n Mail

by Cris Erving

Merge 'n Mail is a sophisticated **mail list** manager with a **mail-merge** feature that can insert your name and address information into letters created with your word processor. It's 8 preset fields include last name, first name, company name, address, city, state, zipcode, and phone number. 12 additional programmable fields allow you to store extra information according to your needs. It sorts by last name, or zipcode. Label formats are easy to specify at print time. It can be used with any ASCII editor.

Requires 64K **Disk $32.95**

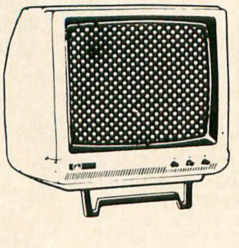
Personal Finance System

by BJ Chambless

Your CoCo is your personal bookkeeper. Set a monthly **budget**, personal chart of accounts, and then enter each transaction. PFS compares monthly expenses with your budget and prints personal financial reports. Tax time is so much easier! The special **Investment and loan module** calculates details of financial transactions like mortgage payments, principals, amortization tables, interest rates, and more so you can analyze your current and future investments. With PFS you can budget, and analyze for the future.

Requires 32K
80 Column printer **Disk $32.95**

Ask for our FREE CoCo Catalog!



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TOTAL ______

than a year ago that when they developed a new machine it would, like the original CoCo, be on the leading edge of technology. With all they have done, the new CoCo 3 is not on the leading edge, it *is* the leading edge.

Don't be fooled by the bare specifications of this machine; look at what it actually does. And the potential is waiting to be tapped by others. In this case, it is the true inheritor of the CoCo tradition: years' worth of potential — things you never dreamed could be done.

Let me make several points:

Forgetting price (I'll come to that in a minute), the CoCo 3 is *the* computer of choice in the forseeable future. Its technical superiority is so vast that it offers virtually unlimited potential for the person who owns one.

Forget about the eight-bit/16-bit/32-bit CPU debate. By designing a custom chip called the GIME, Tandy is on the threshhold of unleashing the full power of the 6809E. It's not what ya' got, it's what ya' do with it that counts.

There is no known interface methodology that CoCo 3 cannot take advantage of. The most obvious is windowing, of course. The ability to have a window/graphics interface will bring millions into the world of computers because they can just use them — they don't have to understand them.

Those millions of people will pay no more than $219.95 for the basic box with all this potential. With only half the capabilities, it would still be a substantial bargain. Considering everything we know today that CoCo 3 can do, Tandy is practically giving their machine away. I expect the ranks of the CoCo Community to be swelled to huge proportions.

With the ease of programming and the general decline in the price of software in other markets, I expect a great influx of new material for the CoCo. Those third party people who have been in this market for some time now will enhance their present products and offer new ones. The great potential of the machine will attract many new writers to the market.

In line with that, let me share some information from Greg. He told me how easy it was to program some of the offerings he is doing for Tandy because he was able to assemble the program in one window and edit his errors in another — at the same time! Think of how much easier that will make programming.

Again, our hat is off to Tandy for making CoCo 3 backward compatible. No sir, you don't have to throw away your software library (or your hardware, either). Assuming programmers followed the guidelines Tandy set down (for just this reason), virtually every piece of software you have now will run on CoCo 3. Every printer, modem, disk drive, cassette recorder and the like will simply plug in to the same place on CoCo 3.

The Color Comptuer 3 is a major achievement by Tandy Corporation. Tandy's new advertising slogan is "Better Again," and in no case is it more evident than in the CoCo 3. Indeed, CoCo 3 sets a new standard of ability and capability, ease of use and friendliness, usefulness and value that no one else can — or likely will — match today or in the near future.

Was CoCo 3 worth the wait?

Yes, is was — every second of every minute of every day.

And more.

— Lonnie Falk

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RAINBOW Info

How To Read Rainbow

Please note that all the BASIC program listings in THE RAINBOW are formatted for a 32-character screen — so they show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little cassette symbol on the table of contents and at the beginning of articles indicates that the program is available through our RAINBOW ON TAPE service. An order form for this service is on the insert card bound in the magazine.

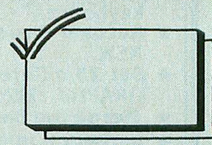
What's A CoCo?

CoCo is an affectionate name that was first given to the Tandy Color Computer by its many fans, users and owners.

However, when we use the term CoCo, we refer to both the Tandy Color Computer and the TDP System-100 Computer. It is easier than using both of the "given" names throughout THE RAINBOW.

In most cases, when a specific computer is mentioned, the application is for that specific computer. However, since the TDP System-100 and Tandy Color are, for all purposes, the same computer in a different case, these terms are almost always interchangeable.

The Rainbow Check Plus



The small box accompanying a program listing in THE RAINBOW is a "check sum" system, which is designed to help you type in programs accurately.

Rainbow Check PLUS counts the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use *Rainbow Check PLUS,* type in the program and CSAVE it for later use, then type in the command RUN and press ENTER. Once the program has run, type NEW and press ENTER to remove it from the area where the program you're typing in will go.

Now, while keying in a listing from THE RAINBOW, whenever you press the down-arrow key, your CoCo gives the check sum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK (35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IFW=7985THEN80ELSEPRINT
   "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

Using Machine Language

Machine language programs are one of the features of THE RAINBOW. There are a number of ways to "get" these programs into memory so you can operate them.

The easiest way is by using an editor/assembler, a program you can purchase from a number of sources.

An editor/assembler allows you to enter mnemonics into the CoCo and then have the editor/assembler assemble them into specific instructions that are understood by the 6809 chip, which controls your computer.

When using an editor/assembler, all you have to do, essentially, is copy the relevant instructions from THE RAINBOW's listing into CoCo.

Another method of getting an assembly language listing into CoCo is called "hand assembly." As the name implies, you do the assembly by hand. This can *sometimes* cause problems when you have to set up an ORIGIN statement or an EQUATE. In short, you have to know something about assembly to hand-assemble some programs.

Use the following program if you wish to hand-assemble machine language listings:

```
10 CLEAR200,&H3F00:I=&H3FB0
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I,VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the `&H3F00` in Line 10 to `&H7F00` and change the value of `I` to `&H7FB0`.

The Rainbow Seal

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The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product that carries the Seal has been physically seen by us, that it does, indeed, exist and that we have a sample copy here at THE RAINBOW.

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The Seal, however, is not a "guarantee of satisfaction." The certification process is different from the review process. You are encouraged to read our reviews to determine whether the product is right for your needs.

There is absolutely no relationship between advertising in THE RAINBOW and the certification process. Certification is open and available to any product pertaining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

We will appreciate knowing of instances of violation of Seal use.

BUILDING SEPTEMBER'S RAINBOW

Holding the presses . . .
Chomping at the bit . . .
To introduce the new CoCo 3

A monthly magazine such as THE RAINBOW is not the medium of choice for fast-breaking news. Not in this age of telecommunicating and broadcast journalism. In fact, about the only thing a monthly magazine can "scoop" is a high school annual, such as provides the background for this month's Education issue cover.

But we do try. If this issue of THE RAINBOW reaches you with a large blank space on the cover saying "This Space for Notes," you'll know we rolled the dice and lost. On the other hand, if our cover artist has the chance before absolute deadline to get a glimpse of the new Tandy Color Computer 3, then we'll have taken a chance and won! Knock on wood.

At the same time, if the first two or three articles in this issue are about anything except the CoCo 3, you'll know that we could not hold the presses any longer, but we think we might just make it. Our current plan — with few contingencies — calls for attending a mid-morning Tandy press conference on July 30 at New York's famed Waldorf-Astoria Hotel. Then we hope to scurry away with "grab photos" and specs under our arms and jet back to Prospect to process the pictures, digest the new machine's specifications and get it all into the magazine in a matter of hours. Let me tell you, it is no sure thing.

Our plan also calls for transferring files by phone lines, reading over the typesetters' shoulders, editing on the run and laying out the pages in record time. Similar standby-then-fly procedures are scheduled right on down the umpteen steps along the production line. This is so we can cover the press conference as well as include material from some "insiders" who cannot release their material until after the formal announcement. At this point, they still cling to saying, "*If* there is a new machine . . .."

While the rest of the world keeps on keeping on, Prospect is aflutter. This is *not* business as usual. (To add to the problem, remember that we produce *two* Tandy magazines! PCM is reporting on the new MS-DOS developments.) Editors are rolling their eyes and audibly sighing, artists are biting their nails, the technical staff is pacing around, hypothesizing about all the possibilities and potential, and production folks are wondering if another "all nighter" is in store. The pre-press and printing people are anxiously tapping their toes, wondering what all the big deal is.

Well, for the CoCo Community, we think it is *the biggest* deal since the CoCo was introduced. We expect the new features to be top-notch and the price to be highly competitive. We expect the CoCo 3 to bring new excitement, new challenges and bright new promise to the CoCo Community. We think you'll be pulling that old machine out and sliding a new one right into place and then rediscovering the same sort of computing thrill you felt when you powered up your first CoCo.

At this point, though Tandy is still as stony silent as Mount Rushmore, the rumors are crystalizing into fact and the likelihood of three text modes (including true lowercase, underline and blinking) and dazzling graphics possibilities seems certain. Tandy's competition will pale in comparison to this new 128/512K machine.

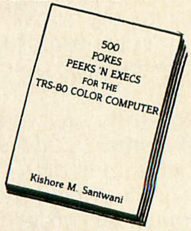
In order to get a complete report to you, we are pushing deadlines back several days and then rushing to make up time. Probably we won't be able to catch up entirely, so this issue is likely to arrive a few days later than usual. We think you'd much prefer this to having to wait another month for the big story we've all been eagerly anticipating for a year or more.

In upcoming issues, we'll delve more deeply into the power of the new CoCo 3 and we'll begin examining and previewing all the new programs as they are rushed to market. We'll report on what present products will work (the vast majority of existing programs and hardware) and what needs "patching" or whatever. To keep up with all that's coming down the road, you'll need THE RAINBOW more than ever, so if you haven't joined the tens of thousands who find THE RAINBOW in their mailbox every month, why not learn about the new CoCo with a new subscription?

— Jim Reed

500 POKEs, PEEKs, 'N EXECs

FOR THE TRS-80 COCO



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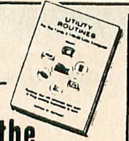

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HARDWARE PREVIEW

CoCo Better Again!

Impressions of the new CoCo 3

By Lonnie Falk
Editor and Publisher

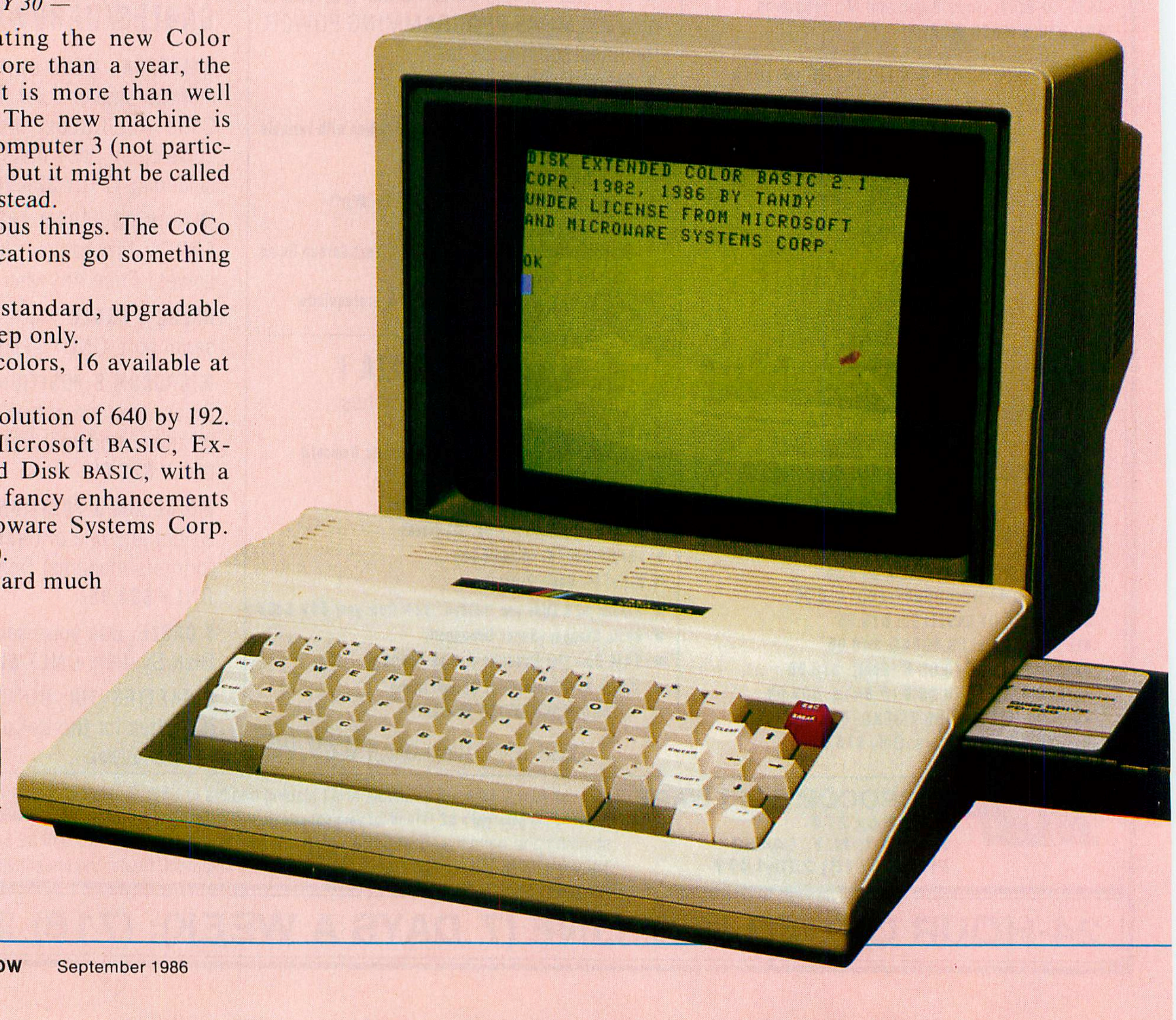
NEW YORK, JULY 30 —

After anticipating the new Color Computer for more than a year, the finished product is more than well worth the wait. The new machine is called a Color Computer 3 (not particularly surprising) but it might be called Warp Factor 3 instead.

First, the obvious things. The CoCo 3 general specifications go something like this:

- 128K RAM standard, upgradable to 512K in one step only.
- 64 different colors, 16 available at a time.
- Graphics resolution of 640 by 192.
- Standard Microsoft BASIC, Extended BASIC and Disk BASIC, with a number of very fancy enhancements written by Microware Systems Corp. (the OS-9 people).
- A new keyboard much the same as

For Lonnie Falk's editorial comments on the CoCo 3, see his "Print #-2", column on Page 12.



```
DISK EXTENDED COLOR BASIC 2.1
COPR. 1982, 1986 BY TANDY
UNDER LICENSE FROM MICROSOFT
AND MICROWARE SYSTEMS CORP.

OK
```

Tandy has done it again

the deluxe keyboard now offered (with a CONTROL and ALTERNATE key and two function keys), but with a newly designed cursor keypad in a diamond configuration.

- A slightly new color scheme for the case, using the now-familiar cream color and a light gray around the edge of the keyboard.
- A choice of 32, 40 and 80 column widths with upper- and lowercase and true descenders.
- Fully compatible with all the software you own now. The caveat to that is software writers cannot have made undocumented calls to the ROM. Tandy developed guidelines for software developers years ago — if authors followed those "rules," their software will work with CoCo 3.
- OS-9 Level II operating system for a true multi-tasking, multi-using environment. More on this later.
- Fully compatible with all the hardware you own now. Just unplug your disk drive, tape recorder, printer and so on, replace your present "box" with a CoCo 3, and plug everything in again. It all works. (There will be a small problem running OS-9 with older models of the Multi-Pak Interface. Tandy will make the fix for about $6, excluding installation.)
- A new interface for a new analog RGB monitor available from Tandy. The new monitor's color scheme matches the CoCo 3.
- Retail price: $219.95.

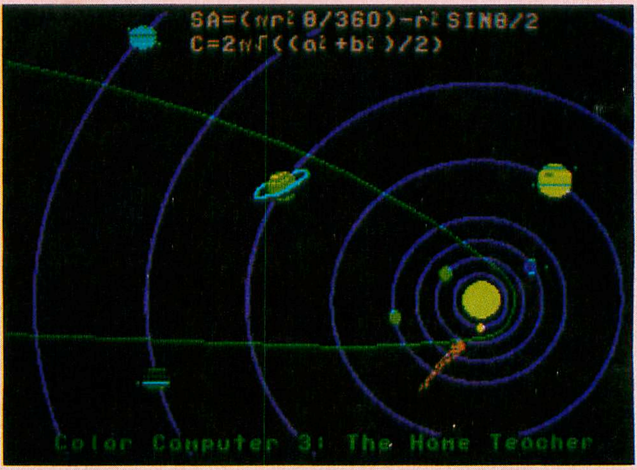
On the surface, these changes are pretty exciting, but not astounding. Yet CoCo 3 is an astounding machine. It is not the changes in the specifications so much as what has been done with the specifications that makes the CoCo, once again, the best possible computer buy for the home or small business market, bar none.

An example: Combining the new analog RGB monitor (a CM-8 by Tandy's designation) and CoCo 3, the resolution on graphics screens appears better than that of an MS-DOS computer. Why? By using analog technology, the resolution appears to be of higher quality than it really is. I can see software writers frothing at the mouth to get at this stuff.

Another example: The CoCo 3 can run at about 2 megahertz, unlike the CoCo and CoCo 2. But, by designing and building a special chip, called a GIME Chip, *effective speed* is increased even more. In a quickie benchmark we performed here, CoCo 3 animation zapped an IBM PC and a Macintosh. CoCo 3's bouncing ball demonstration is faster and smoother than Amiga's or the Atari ST's.

There are two versions of what the term "GIME" stands for. I like the one that says Tandy went out and said they needed to be able to do this thing, that thing and so on, so please "Gimme a chip that'll work." Officially, though, GIME stands for Graphic Interrupt Memory Enhancer. Take it either way, this li'l' fellow makes CoCo 3 a super special machine.

I confess to not understanding hardware like the Tony DiStefanos and Marty Goodmans of the world. And I am certain that, over the coming months, they will be able to tell you a great deal of technical stuff about it. But suffice it to say now that this new chip manages memory through interrupts, and speeds everything along its way far more swiftly than the old VDG and SAM chips (which are not in the CoCo 3) did.



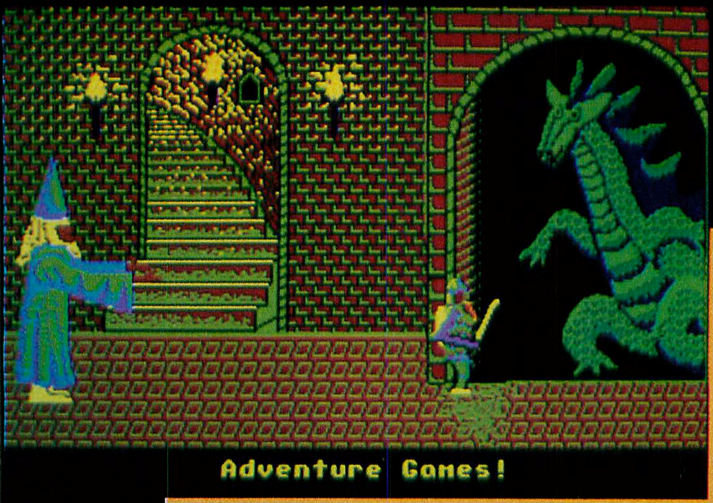
For one thing, GIME makes true multi-user, multi-tasking possible. It allows some of the most sophisticated (and easy-to-use) windowing available on any computer available today. As an example, you could be connected through a modem to someone else with a CoCo 3 in one window, and have a graphics drawing program in a second window (windows mean both *programs* are running at the same time and are displayed on the screen at the same time). The person on the other end could be explaining how something looks and while he is explaining it, you could be drawing it. Then, to be sure you got it right, you could send your drawing to the telecommunications program window and it would appear on the other person's screen. That person could make some changes and send it back to you, and so on!

CoCo 3 has, under OS-9 Level II, a user interface much like the Macintosh, but far faster and in full color. For the CoCo 3, OS-9 has become virtually invisible to the user who wants it that way — in other words, you can deal with the applications and programs you want, and pretty much ignore the operating system unless you want to use it.

In short, CoCo 3 is a new generation of home and small business computer — fully as revolutionary as the original Color Computer was five years ago. Its great advantage is that it already has one of the largest bases of software (and hardware for that matter) of any machine on the market, plus a raft of OS-9 Level II software which has been around for some time.

All that aside, where it will shine most brightly will be when both in-house and third party software and hardware people begin writing specific programs which take advantage of the GIME chip, the windowing environment and all the other marvelous features of CoCo 3.

Even at $600, CoCo 3 would be the best single home and small business buy in the world of computers. At $219.95, it is not only a stupendous machine, but an immense bargain as well. With the Color Computer 3, Tandy has moved to the cutting edge of technology and made the technology affordable for virtually everyone.



Samples of 320 by 192 mode from demo program for new CoCo 3. Sixteen colors available. Highest resolution available: 640 by 192.

Tandy Color Computer 3 Does Windows, and a Whole Lot More

By Greg L. Zumwalt

I recently received my sixth Color Computer. As an applications programmer, I tend to wear them out long before their time. I use Color Computers in developing software and hardware for the CoCo as well as other equipment, and give the poor machines quite a beating in the process.

I removed Color Computer five from active duty and plugged number six into the expansion interface. After installing the OS-9 boot disk in Drive 0, I typed `DOS`, and a message appeared on the screen:

```
Welcome to OS-9 Level II for the
Color Computer 3
```

Level II? Color Computer 3?

Hardware Preview

The Tandy Color Computer 3 is a true next generation CoCo. The heart of the machine is a two-megahertz 6809 teamed with the Tandy designed GIME (Graphics Interrupt Memory Enhancement) chip. The GIME contains the Color Computer 3 enhancements, as well as the standard Color Computer VDG logic. Tandy retained the older Color Computer logic to remain compatible with most of the existing CoCo software. The enhancements, however, are impressive.

How about 512K RAM capacity with an MMU (Memory Management Unit) to assist in managing it? Or 320 by 192 16-color graphics? Or 640 by 192 four-color graphics? What about composite, RGB or standard RF video-output? I like an 80-column display. The Color Computer 3 contains all of these features, plus more.

Software

Tandy provides various software enhancements that utilize the Color Computer 3 hardware. BASIC is compatible with previous 64K Extended BASIC, but allows setting screen widths (32, 40 or 80 columns), screen colors (foreground, background *and* the border), graphics modes (now up to 640 by 192, four colors), and more.

However, the real power of the new Color Computer becomes apparent with Microware's OS-9 Level II Oper-

TANDY
Memory expandable to 512K

An independent programmer and computer designer, Greg Zumwalt is one of the select few writing Tandy software for the new Color Computer 3. He owns ZCT Software of Tulsa, Oklahoma.

ating System. For those of you not familiar with OS-9, I would suggest that now there is a real reason to develop an interest in it. For those of you familiar with Level I OS-9, you will really enjoy Level II. Level II is designed to exploit the expanded RAM capacities of the Color Computer 3, like Level II on other systems. But there is a difference. Level II OS-9 for CoCo 3 supports windowing, a feature that, after having used it, I don't ever want to give up.

Windows

A window is an area appearing on the screen that acts just like a regular display, the main difference being you can assign more than one window to the same screen. For example, as an applications programmer, I am constantly switching between a text editor, an assembler, the application and a debugger. Anyone who has written assembly language programs knows that this cycle often repeats, sometimes many times, resulting in lots of typing and typing errors.

With windowing, I simply place a text editor window in the upper left-hand corner of the screen, an assembler window in the upper right-hand corner of the screen, a debug window in the lower left-hand corner of the screen, and finally, an application window in the lower right-hand corner of the screen. Each of these windows now acts as though I have four separate Color Computers. While the application is running, I can edit, assemble and debug all at the same time. Output from any of the programs appears instantly on the associated window. To direct input to a particular program, all I have to do is press the CLEAR key on the keyboard until the cursor appears on that window, then type. OS-9 allows me to define the size and location of each window. I can even define a window as the entire screen, in which case OS-9 switches screens when I want to work on another.

How does this work? OS-9 is what is known as a multi-tasking/multi-user operating system. This means OS-9 is designed to allow more than one program (called a task) and more than one user at a time to share the same computing resources. Level II OS-9 for the CoCo 3 takes this concept one step further by providing more than one screen (the window) to accomplish this. Let's go through the process of creating a window using the OS-9 Build utility.

Building Your First Window

The Build utility allows us to create an OS-9 procedure file. A procedure file is simply a disk file containing a series of OS-9 commands that OS-9 executes in order. To create the procedure file, at the OS-9 prompt, type the following:

```
build window
```

The Build utility responds with a question mark followed by a space. Now type the following:

```
iniz w1
merge sys/stdfonts >/w1
display 1b 20 07 00 00 20 0b 00
   07 07>/w1
shell i=/w1&
```

Press ENTER twice after this last line.

After the last ENTER, the Build utility returns to OS-9. There is now a procedure file on the disk called Window1. To run the procedure, at the `OS-9:` prompt type:

```
window1
```

OS-9 responds with the '&' symbol followed by a number. This verifies that the Window1 procedure accomplished its task. To see what happened, press the CLEAR key on the keyboard. A new screen appears with a window in the upper left-hand corner containing the OS-9 prompt. This window, with its shell, allows you to execute OS-9 commands just like the original screen. In effect, you have two computers. Press the CLEAR key again, and the original screen reappears. Let's examine the procedure file we created and see how it works.

Under OS-9 Level II, a window is treated as simply another OS-9 device. The device name for a window contains the window descriptor (the 'w') and the window number (in this case 1). Therefore, to talk to window one the descriptor w1 is used.

The first command, Iniz, initializes w1. This is similar to an Iniz of any other OS-9 device.

The second command, Merge, tells OS-9 which character set is to be used with w1 (a variety of character fonts are now possible with the Color Computer 3).

The third command, Display, sends the command sequence to OS-9 that creates the window. The command sequence contains 10 bytes describing to OS-9 the command, type, location, size and color of the window to create. The first two bytes following Display are the create a window command. The third byte defines the window type; in our example, a 640 by 192 four-color graphics window. The fourth and fifth bytes decribe the 'X' and 'Y' character location of the upper left-hand corner of the window. The sixth and seventh bytes define the 'X' and 'Y' character size of the window. Finally, the eighth, ninth and 10th bytes describe the foreground, background and border colors for the window.

The fourth command, Shell, creates a shell for w1. The shell is what allows you to execute any of the OS-9 commands or applications.

Building Your Second Window: A BASIC Approach

To further illustrate, let's create a second window. However, this time let's create it using BASIC09 (which, by the way, is included with the OS-9 Level II operating system), and place it on the same screen that w1 occupies, but in the upper right-hand corner. Press the CLEAR key to display w1, then at the `OS-9:` prompt, type:

```
Basic09
```

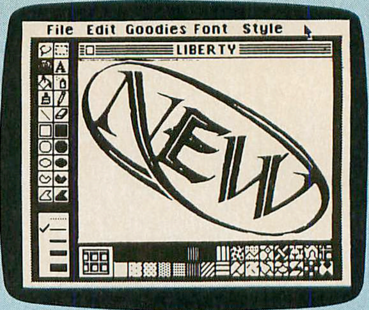
The BASIC09 prompt appears, followed by `B:`. From here, type in the following:

```
e window2
  shell "iniz w2"
  dim command,path:byte
  dim count:integer
  data 27,32,0,40,0,32,11,7,0,7
  open #path,"/w2":write
  for count=1 to 10
  read command
  put #path,command
  next count
  shell "shell i=w2&"
  end
q
run
```

A second window appears just to the right of the first, whose foreground/background colors are opposite those of w1. Now press the CLEAR key. Notice the cursor on w1 disappears, while a cursor appears on w2. Each time the CLEAR key is pressed, the next window is selected for keyboard input in round robin fashion.

The BASIC approach appears somewhat different from the procedure file approach; however, they both accomplish the task in a similar manner. The first line of the BASIC approach calls the BASIC09 editor, allowing you to type in the program. The second line tells BASIC09 to send the Iniz w2 command

CoCo Max™ II



You'll use it all the time and love using it.

What is CoCo Max?

Simply the most incredible graphic and text creation "system" you have ever seen. A Hi-Res Input Pack (more on the pack later) is combined with high speed machine language software. The result will dazzle you.

CoCo Max
CoCo Max II

CoCo Max disk system, with Y-cable.

Is CoCo Max for you?

Anyone who has ever held a pencil or a crayon for fun, school or business will love it. A 4 year-old will have fun doodling, a 15 year-old will do class projects and adults will play with it for hours before starting useful applications (illustrations, cards, artwork, business graphics, flyers, charts, memos, etc.) This is one of the rare packages that will be enjoyed by the whole family.

What made CoCo Max an instant success?

First there's nothing to learn, no syntax to worry about. Even a child who can't read will enjoy CoCo Max. Its power can be unleashed by simply ***pointing*** and ***clicking*** with your mouse or joystick. With ***icons*** and ***pull down menus,*** you control CoCo Max intuitively; it works the same way you think.

Don't be misled by this apparent simplicity. CoCo Max has more power than you thought possible. Its blinding speed will astound you.

It lets you work on an area 3.5 times the size of the window on the screen. It's so friendly that you will easily recover from mistakes: The ***undo*** feature lets you revert to your image prior to the mistake. As usual, it only takes a single click.

Later, we will tell you about the "typesetting" capabilities of CoCo Max II, but first let's glance at a few of its graphic creation tools:

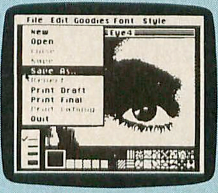
With the ***pencil*** you can draw free hand lines, then use the ***eraser*** to make corrections or changes. For straight lines, the convenient ***rubber-banding*** lets you preview your lines before they are fixed on your picture. It's fun and accurate. Lines can be of any width and made of any color or texture.

The ***paint brush,*** with its 32 selectable brush shapes, will adapt to any job, and make complicated graphics or calligraphy simple.

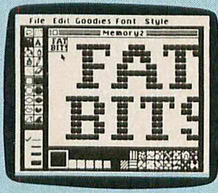
For special effects, the ***spray can*** is really fun: 86 standard colors and textures, all available at a click. It's like the real thing except the paint doesn't drip.

CoCo Max will instantly create many shapes: circles, squares, rectangles (with or without rounded corners), ellipses, etc. Shapes can be filled with any pattern. You can also add hundreds of custom patterns to the 86 which are included.

The ***Glyphics*** are 58 small drawings (symbols, faces, etc.) that can be used as rubber stamps. They're really great for enhancing your work without effort.



Pull down menus



Zoom in!

Control Over Your Work

CoCo Max's advanced "tools" let you take any part of the screen, (text or picture) and perform many feats:

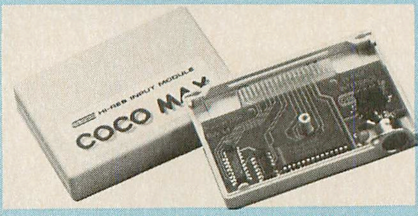
- You can move it around
- Copy it
- Shrink or enlarge it in both directions
- Save it on the electronic ***Clipbook***
- Flip it vertically or horizontally
- Rotate it
- Invert it
- Clear it, etc. etc.

All this is done instantly, and you can always ***undo*** it if you don't like the results.

For detail work, the ***fat bits*** (zoom) feature is great, giving you easy control over each pixel.

To top it all, CoCo Max II works in color. Imagine the pictures in this ad in color. If you own a Radio Shack CGP-220 or CGP-115, you can even print your work in full color!

There is so much more to say, such as the capability to use CoCo Max images with your BASIC programs, the possibility to use CoCo Max's magic on any standard binary image file. There are also many advanced features such as the incredible ***lasso***.



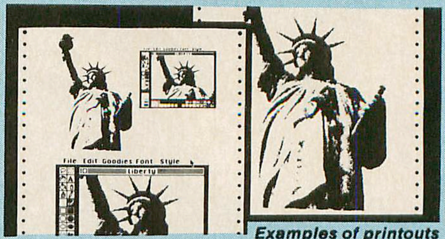
Inside the Hi-Res Input Pack

Why a Hi-Res Input Pack?

Did you know that the CoCo joystick input port can only access 4096 positions (64x64)? That's less than 10% of the Hi-Res screen, which has 49152 points! (256x192). You lose 90% of the potential. The Hi-Res Input Pack distinguishes each of the 49152 distinct joystick or mouse positions. That's the key to CoCo Max's power. The pack plugs into the rom slot (like a rom cartridge). Inside the pack is a high speed multichannel analog to digital converter. Your existing joystick or mouse simply plugs into the back of the Hi-Res Pack.

Electronic Typesetting...

You'll be impressed with CoCo Max's capability. Text can be added and moved around anywhere on the picture. (You can also rotate, invert and flip it...) At a click, you can choose from 14 built in ***fonts*** each with 16 variations. That's over 200 typestyles!


File Edit Goodies Font Style
Liberty

Examples of printouts

Printing Your Creations

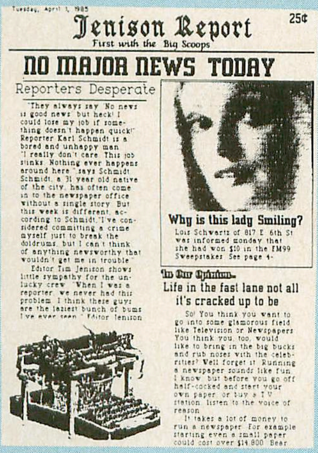
There are a dozen ways to print your work. All are available with a click of your joystick (or mouse) without exiting CoCo Max. Your CoCo Max disk includes drivers for over 30 printers!

All the CoCo Max pictures are **unretouched** screen shots or printouts (Epson RX-80).

CoCo Max II™

The whole family will enjoy CoCo Max. Here are a few examples of the possibilities.

All these pictures are **unretouched** screen photos or printouts (on an Epson RX-80).



Tuesday, April 1, 1985

25¢

Jenison Report

First with the Big Scoops

NO MAJOR NEWS TODAY

Reporters Desperate

"They always say 'No news is good news' but heck! I could lose my job if something doesn't happen quick!" Reporter Karl Schmidt is a bored and unhappy man. "I really don't care. This job stinks. Nothing ever happens around here," says Schmidt. Schmidt, a 31 year old native of the city, has often come in to the newspaper office without a single story. But this week is different, according to Schmidt. "I've considered committing a crime myself just to break the doldrums, but I can't think of anything newsworthy that wouldn't get me in trouble."

Editor Tim Jenison shows little sympathy for the unlucky crew. "When I was a reporter, we never had this problem. I think these guys are the laziest bunch of bums I've ever seen." Editor Jenison

Why is this lady Smiling?

Lois Schwartz of 817 E. 6th St was informed monday that she had won $10 in the FM99 Sweepstakes. See page 4-

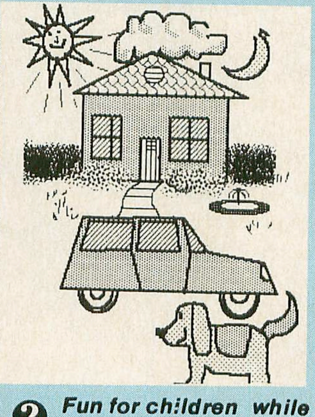
In Our Opinion.

Life in the fast lane not all it's cracked up to be

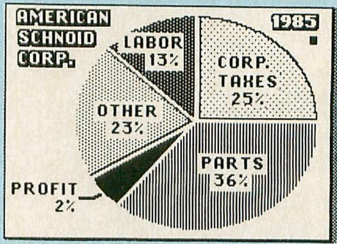
So! You think you want to go into some glamorous field like Television or Newspapers. You think you, too, would like to bring in the big bucks and rub noses with the celebrities? Well forget it. Running a newspaper sounds like fun, I know, but before you go off half-cocked and start your own paper, or buy a T.V. station, listen to the voice of reason.

It takes a lot of money to run a newspaper. For example, starting even a small paper could cost over $14,800. Bear

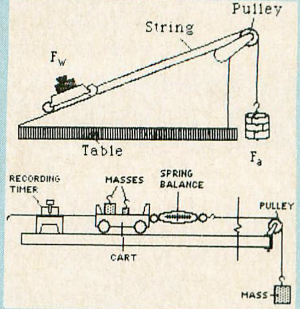
① *Publish a newsletter or bulletin*



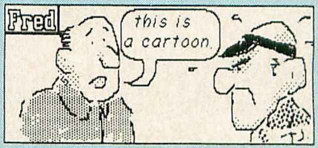
② *Fun for children while stimulating creativity.*



③ *Business graphs, charts, diagrams. Also memos*

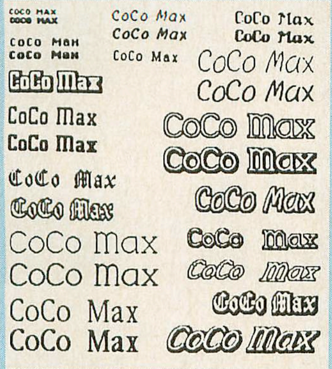


④ *Junior's homework and science projects. Term papers too!*

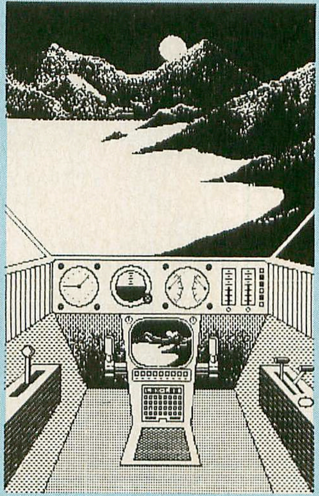


⑦ *Video portrait (with optional digitizer).*

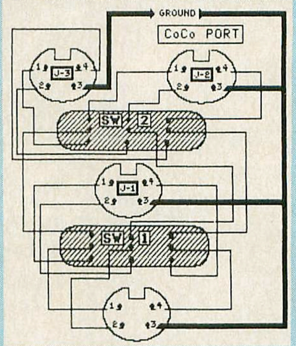
⑧ *This is a cartoon.*



⑤ *Over 200 typestyles to choose from! generate flyers.*



⑥ *A new way to express your imagination.*



⑨ *schematics and floor plans.*

CoCo Max II
CoCo Max II
CoCo Max II
CoCo Max II

⑩ *Logos and letterheads.*

System Requirements:

Any 64K CoCo and a standard joystick or mouse. (The koala pad and the track ball work, but are not recommended.)
Disk systems need a Multi-Pak or our Y-Cable.
CoCo Max is compatible with any Radio Shack DOS and ADOS.
Note: the tape version of CoCo Max includes almost all the features of CoCo Max II except *Shrink, Stretch, Rotate,* and *Glyphics.* Also, it has 5 fonts instead of 14.
CoCo Max is not compatible with JDOS, DoubleDOS, MDOS, OS-9, the X-pad, and Daisy Wheel Printers.

Printers Supported:

Epson MX, RX, FX and LX series, Gemini, Star, Micronix, Delta 10, 10X, 15, 15X, SG-10, Okidata 82A, 92, 93, C. Itoh Pro-writer, Apple Image-writer, Hewlett-Packard Thinkjet, Radio Shack DMP 100, 105, 110, 120, 200, 400, 500, Line Printer 7, Line Printer 8, TRP-100, CGP-220. (DMP-130 use Line Printer 8), PMC printers, Gorilla Banana.
Color printing: CGP-200, CGP-115

Pricing

CoCo Max on tape with Hi-Res Pack and manual.	$69.95
CoCo Max II (disk only) with Hi-Res Pack and manual.	$79.95
Upgrade: CoCo Max to CoCo Max II New disk and manual	$19.95
New features of CoCo Max II: 14 fonts and glyphic font, dynamic shrink and stretch, rotate, multiple drive capability, 68 page scrapbook, point and click file load, color printer drivers, full error reporting.	
Upgrade: CoCo Max tape to disk manuals, disk and binder	$24.95
Y-Cable: *Special Price*	$19.95
Super Picture Disks #1, #2, and #3 each:	$14.95
All three picture disks	$29.95

Guaranteed Satisfaction
Use CoCo Max for a full month.
If you are not delighted with it,
we will refund every penny.

Font Editor Option

A font is a set of characters of a particular style. CoCo Max includes 15 fonts. You can create new fonts of letters, or even symbols or graphics with the font editor. Examples: set of symbols for electronics, foreign alphabets, etc. $19.95

Video Digitizer DS-69

This new Low Cost Digitizer is the next step in sophistication for your CoCo Max system. With the DS-69 you will be able to digitize and bring into CoCo Max a frame from any video source: VCR, tuner, or video camera. Comes complete with detailed manual and C-SEE software on disk. Multi-Pak is required.

New Low Price Save $50	$99.95
New: faster DS-69A	$149.95

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to OS-9, the same as Iniz w1 of the *procedure* file approach. The third and fourth lines define the variable types to be used in the program (a requirement of BASIC09). The fifth line is a `DATA` statement containing the command sequence that creates the window. The sixth line opens a path allowing BASIC to communicate with window two. The seventh, eighth, ninth and 10th lines are a `FOR/NEXT` loop, reading data from the `DATA` statement and sending it through the path to window two. The 11th line creates a shell on window two. The 12th line ends the program. The 13th and 14th lines exit the BASIC09 editor and run the program.

Putting Windows to Work

It is important to realize that even though a window is not selected for keyboard input, the program on it is still running. To illustrate, let's put the two windows we have created to work. We will make window one (w1) a clock that displays date and time continuously. Then, on window two (w2) we'll illustrate another windowing concept.

Press the CLEAR key on the keyboard until the cursor appears on w1. Then from the BASIC09 `B:` prompt, type:

```
kill window2
e clock
  dim time:string
  print chr$(12)
  10 if date$=time then goto 10
  else
  time=date$
  print chr$(1)
  print time
  endif
  goto 10
q
run
```

A BASIC09 program called *Clock* is now running on w1, displaying the time. Now press the CLEAR key. Notice that the cursor moved to w2, but the clock program on w1 is still running. This is an example of how multi-tasking/multi-user and, of course, windowing really shine. W2 is now available to write another program, run a game, or whatever, while w1 continues to run the clock! Another plus from the `OS-9:` prompt on w2, type:

```
  Basic09
```

Now you have both w1 and w2 available for BASIC programs, but the real plus is both w1 and w2 share the same copy of BASIC09. No need for a second copy. The design of OS-9 allows programs to be re-entrant, essentially meaning that the same program can be used by more than one person at the same time, providing big savings in memory.

The Overlay Window

The windowing system provides a second type of window, the overlay window, which does what the name suggests. An overlay window overlays an existing device window (windows w1 and w2 that we previously created are device windows). Overlay windows are useful when an application needs to prompt the user for input, display menu selections, announce messages and so forth, because they can be designed to really attract the user's attention.

Creating an overlay window is relatively simple. So while our clock is running on w1, we will use BASIC09 on w2 to create our first overlay window.

From the BASIC09 `B:` prompt on w2, type:

```
e overlay
  dim count:integer
  dim command,path:byte
  data 27,34,1,2,2,12,4,0,7
  open #path,"/w2":write
  for count=1 to 9
  read command
  put #path,command
  next count
  print " this is an"
  print " overlay"
  print " window"
  10 goto 10
  end
q
run
```

The program creates an overlay window on window two with the message `this is an overlay window`. The program is similar to the window two program we wrote earlier. However, the data in the `DATA` sequence contains nine bytes. The first two bytes are the create an overlay window command. The third byte tells OS-9 to save the area under the overlay window, and restore it after we are finished with it (we will see this in a moment). The fourth and fifth bytes are the 'X' and 'Y' location of the upper left-hand corner of the overlay window in relation to the device window (w2). The sixth and seventh bytes are the 'X' and 'Y' size of the overlay window. The eighth and ninth bytes are the foreground and background colors respectively.

Notice in the BASIC program, Line 10 calls itself. This was to stop the program before the `END` statement was encountered. Now press the BREAK key. The program is stopped, but all output to window two is still appearing within the overlay window. For example, let's list the overlay window program using the BASIC09 list function. From the `B:` prompt type:

```
  list overlay
```

The overlay window program is listed in the overlay window. When you create an overlay window, all subsequent output to the device window containing the overlay window will appear in the overlay window. The overlay window must be turned off with the turn off overlay window command. To send the turn off command from BASIC09 at the `B:` prompt, type:

```
  $display 1b 23
```

Notice that OS-9 restored the original image that was under the overlay window. This is because in the create an overlay window command we told OS-9 to save the area under the overlay window by setting the third byte of the command sequence to a value of one. If you set this value to zero, OS-9 will not save the area under the overlay window, and thus will not restore the area when the overlay window is turned off.

Implications

Imagine using your Color Computer 3 as a home security system, and at the same time typing a letter to a friend or business associate. Meanwhile a large C language program is compiling, and a telecom program is downloading the latest stock quotes from an online information service, all at the same time, all on the same screen, and all without ever having to disable the home security system.

Sound impossible? The Tandy Color Computer 3 teamed with Microware's Level II OS-9 and the Windowing System is designed for easy implementation of just such an environment. As we have illustrated, it is not just a fancy display package. It is a powerful tool for both user and programmer, providing the real benefits of a multi-tasking/multi-user operating system in a manner that doesn't require an assembly language applications programmer to implement.

The Amazing A-BUS

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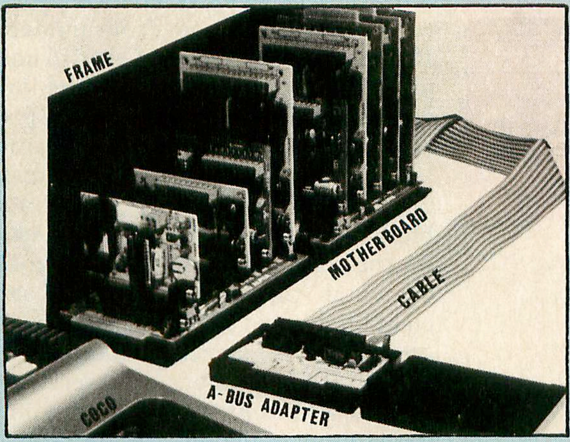
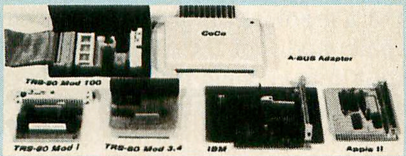


An A-BUS system with 2 Motherboards and 9 Cards.



A-BUS Adapters

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SHEILA wanted to set up a variety of experiments in her lab. With an A-BUS, the computer can watch the mice instead of Sheila.
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What if I change computers? Incredibly, this is as simple as replacing the inexpensive adapter card.

CoCo to A-BUS Adapter AR-138: $49

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Disk systems without Multipak need Y-cable ($19.95)

A-BUS adapter for: AApple II, II+, IIe.	AR-134...$49
IBM PC, XT, AT and all compatibles.	AR-133...$69
TRS-80 Models 100, 200.	AR-135...$69
TRS-80 Mod 3,4,4D. Fits 50 pin I/O bus.	AR-132...$49
TRS-80 Model 4P. Includes extra cable.	AR-137...$62
TRS-80 Model I. Plugs into 40 pin I/O bus.	AR-131...$39

A-BUS Motherboard MB-120: $99

Will accomodate five A-BUS cards. A sixth connector allows a second motherboard to be added to the first (with connecting cable CA-161...$12). Up to five motherboards can be joined this way to a single adapter. The motherboard is mounted on a sturdy aluminum frame with card guides.

A-BUS Cable (3 ft.) CA-163: $29

Connects Adapter to 1 A-BUS card or Motherboard.
Special Cable for two A-BUS cards **CA-162...$39**

Relay Card RE-140: $129

8 industrial relays on board. Contacts are rated at 3 amps. You can control up to 64 cards (512 relays) using several motherboards. Jumpers are used to simply select the card address. The card is easily controlled in BASIC with "OUT" or "POKE". For example, OUT 1,0 turns all the relays off on card #1. Eight LED's show which relays are on.

Digital Input Card IN-141: $49

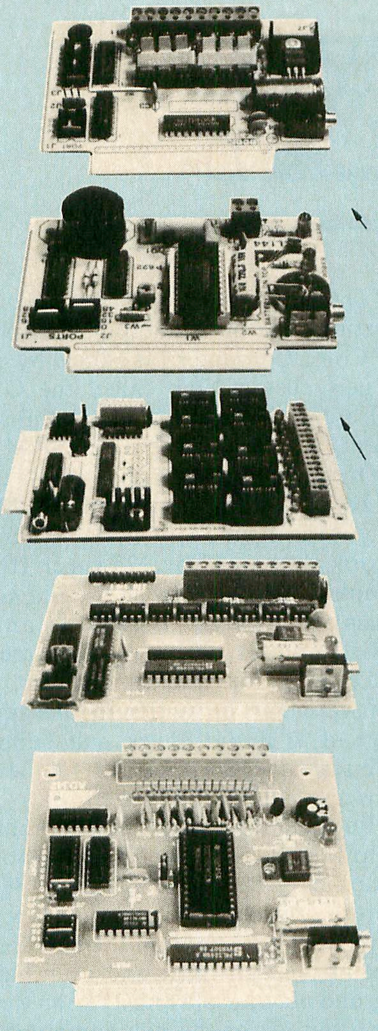
It's safe and easy to connect and read switches, keypads, thermostats, alarm loops, etc. The eight inputs can monitor the presence of voltage or switch position. Simple INP or PEEK commands read the status (On or Off) of the inputs. Each input is optically isolated for convenience and safety.

Analog Input Card AD-142:$119

With this 8 bit, 8 channel A/D converter, your computer can read voltages, temperatures, pressures, light levels, etc. Take over 100 readings per second in BASIC (several thousand with machine language). It's simple to use, for example: OUT 1,3 selects channel #3, then A=INP(1) reads the voltage on that channel. Input range: 0 to 5.1V. Resolution: 20mV. Conversion time 120us.

Prototyping Card PR-152: $15

Protocard is 3½ by 4½ in. and accepts up to 10 IC's.



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Stepper Motors are the ultimate in motion control. The special package (below) includes everything you need to get familiar with stepper motors: Each controller card drives **two** stepper motors (12V, bidirectional, 4 phase).
Motor: 48 steps/revolution, 300 steps/second, ¼" shaft: MO-103...$15. Power supply: PS-126...$10
Special Package: the controller card, *two* stepper motors, and power supply: **PA-181...$99**

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COMMENTARY

The Color Computer 3: A Programmer's Dream

**By
Steve
Bjork**

While I was writing this article about the new Color Computer 3, I realized that the CoCo has been the same basic computer for over six years! In this day of ever-changing computers, that's a long time. True, Tandy repackaged our lovable little CoCo (called the Color Computer 2), but with no real hardware or software changes.

Programmers have learned how to push the Color Computer to its outer limits. But with the old CoCo hardware, we just can't break any new ground. That's why Tandy is introducing the Color Computer 3.

The new Color Computer 3 is on the cutting edge of technology. The power of Color Computer 3 is gained by using a new custom chip called the GIME (Graphics Interrupt Memory Enhancement) in place of the older SAM and VDG chips. This new chip allows up to 512K of memory controlled by a Memory Management Unit (MMU for short), and a 640 by 225 super Hi-Res graphics screen at twice the old Color Computer speed. Using the analog RGB monitor, 225 scan lines are the maximum supported; however, new software must be written to take advantage of it. Radio Shack only supports 192 scan lines for use with TV viewing devices. Not bad for one chip!

But how can these hardware changes help the programmer? Take a look at graphics game called *Marble Maze*. Before, it was just a little too slow. But with twice the speed on the new CoCo, it is at the right pace and I am having a grand old time playing it! Soon we will see programs on this new computer that would have been too slow before.

The new text display modes are going to be a real help to programmers. Before, the text screen had only 16 lines of 32 characters each and no true lowercase. On the CoCo 3 the text display mode has 24 lines and up to 80 characters per line. Not only has lowercase been added, but also underlining and blinking attributes for each character on the screen. Because this is a *color* computer, the attributes also include eight foreground colors and eight background colors for each character.

With these additions, it is very easy to write a word processor that not only shows more of the text, but also shows any spelling errors by highlighting them in red lettering.

For a graphics programmer, the new graphic modes of the Color Computer 3 are a dream come true. Not only do we have about four times the dot resolution, but up to 16 colors on the screen at one time. On the old Color Computer there was a maximum of four colors with the colors never changing in that mode. The Color Computer 3 has up to 16 colors per screen with 64 colors to choose from. When a dot is placed on the screen only the color register (or palette) is selected. The color register holds the true color to be displayed. If a programmer wants to change all the red on the screen to yellow, all he needs to do is change that palette from the red to the yellow color code.

Let's use a picture of the New York sky line at day for example. By changing a few color registers this daytime scene slowly changes to one of dusk, then to a nighttime scene with twinkling stars. All of this done by a BASIC program using the palette command!

One problem with a higher resolution display mode is it can take up to 32K of memory to display one screen. In just using two graphics screens all 64K of memory the 6809 can address would be used up. This is where the Memory Management Unit comes into play. Only one graphics screen needs to be addressed by the 6809 at one time, so the MMU is programmed to select one screen and place it in the 6809 address range.

The new BASIC ROM in the Color Computer 3 takes this one step further. The new higher resolution display modes do not use any of the BASIC program space as did the older Color Computer's graphics modes. This gives

---

Steve Bjork has been a programmer for over 15 years. In his association with Datasoft he has authored such programs as Zaxxon, Sands of Egypt *and* Mega-Bug. *He now handles product development for his own company, SRB Software. He is one of the people chosen by Tandy to write programs for the new Color Computer 3.*

the BASIC programmer about 27K of memory (after doing a PCLEAR 1) for programs and variables, while still using a maximum size graphics screen of 32K!

A Programmer's Dream: OS-9 on the Color Computer 3

Tandy did not stop at hardware when they were improving the Color Computer; it takes software to run any computer. A more powerful and upward compatible version of OS-9 called Level II is the real key to the power of the Color Computer 3. This OS-9 Level II is able to give each program up to 63.5K of memory to work in. That is a lot workspace on a 512K system! On the old Color Computer there was only 35K to 40K to work with.

With OS-9 being a multi-tasking/multi-user operating system it would be kind of nice to use one screen for compiling a program while using another for editing a different program. By adding the Multi-View windowing system, it is as easy as pressing the CLEAR key to move from window to window. In one window you could be editing a program, then in the next window be running a test version of the program, and have all debug data in yet another window.

Each window can be in text or graphics modes and can take up all or only part of each screen. You can even put several windows on the same screen as long as they don't overlap.

If that is not enough to get a programmer drooling, there is a full point-and-click interface with drop-down menus built into the Multi-View package. A full set of graphics drawing commands like LINE, BOX, FILL, CIRCLE, ELIPSE and GET/PUT buffers are included to round out the package.

The Multi-View package holds most of what a programmer needs to do programs like the *CoCo Max*. As a matter of fact, this package already has about 80 percent of the code that Tim used in that landmark program for the older Color Computers. It will not be long before we see many top of the line drawing programs under OS-9.

This is one programmer's view of the Color Computer 3. It has a lot of what we've been asking Tandy for in the way of power. So, I better get back to work; I have a few programs to develop that will knock your socks off!

What's an Analog RGB Monitor Anyway?

By Ed Ellers

The Color Computer has had an RF output ever since its inception way back in 1980. This means the CoCo can be used with a standard TV set instead of a special monitor, and also that the display quality is affected by the limitations of TV (which were never intended for computer displays anyway). Many CoCo buyers have added video output jacks to their computers in order to use monitors.

Now, we have the Color Computer 3 and it has the same TV jack on the back panel along with the Channel 3|4 switch, so it still works with home TV sets. Tandy has also added video and audio output jacks to allow a factory-approved connection to a monitor (or to a VCR). It sounds like the answer to a bleary-eyed hacker's dream — but wait! On the bottom there's a strange seven-pin socket. What for? It turns out that Tandy has introduced a new 13-inch analog RGB monitor — the CM-8 — that displays the CoCo 3's text and graphics much more clearly than a composite monitor can.

RF Output

The RF output is the TO TV output that feeds into your TV set on Channel 3 or 4; the signal is much the same as what you would receive from a broadcast station or cable. The problem with this isn't so much that the RF modulator inside the computer is distorting the signal, but that the tuner and especially the IF amplifier in most TV sets do terrible things to the incoming signal in the process of changing it back into raw video. If you were to use an oscilloscope to look at the signal going into the video amplifier stages of your TV set and compare this with what goes into the modulator of your CoCo, you'd be surprised that the picture you see looks as good as it does.

Many newer TV sets have improved circuitry that gives a flatter frequency response and causes less signal distortion, but using an RF hookup is still a roundabout way to do it and far from ideal. That's why the more expensive color TV sets nowadays have video input jacks for better pictures from VCRs, videodisc players and satellite receivers; more to the point, it's also why many CoCo users have ignored the RF output in search of something better.

Composite Video

Composite video is the output from a TV camera or from the VIDEO OUT jack on a VCR; it's also what you get from a monitor adapter board for a CoCo, and from the video output on the CoCo 3. Composite means the signal includes horizontal and vertical synchronizing pulses and blanking pulses as well as video; it's the same as the signal that goes into the RF modulator in the CoCo (or into the TV station's transmitter). In black and white, a composite signal carries a lot more detail than an RF signal does, and with a good monochrome monitor (which can be black and white, but is more often green or amber) you get very clear text and graphics.

However, a composite color signal has many of the same problems that the RF method had. To squeeze three colors, which logically would take up as much space as three black and white signals, into the space of one TV channel and still have a useful black and white picture at the same time, color TV systems create a black and white signal from the three colors and then create a subcarrier to carry the added color information. The subcarrier can't handle as much detail as is present in the monochrome "luminance" signal; this works out reasonably well for regular TV viewing, but definitely doesn't when you're looking at Hi-Res graphics at close range.

There are also various imperfections in the process of separating the subcarrier from the luminance signal (we'll get to one of them later). With the Color Computer 3 there's a better way.

Analog RGB

RGB simply stands for red, green and blue, the three primary colors of color TV and computer displays. This method involves sending each color signal to the monitor over its own wire in the monitor cable. The signals are never mixed together, so there's no problem in separating them, and since the signals are only traveling a few feet there's no problem with band width.

This is the ideal way to display color graphics, but you do need the red, green and blue signals coming from the computer and a monitor that can handle them. The output is taken care of by the new GIME chip in the CoCo 3; the monitor is Tandy's new CM-8, which, at $299, is quite a bit less expensive than the analog RGB monitors sold for use with Commodore's Amiga and the Atari ST series computers.

"Analog" means the voltage fed to the monitor varies with the signal level for each color. In a digital RGB monitor, such as the ones used with the Tandy 1000 and the IBM PC, the red, green and blue signals simply go on and off. A digital RGB monitor generally only shows sixteen colors with four signal lines; the colors available with analog RGB monitors are limited only by the computer.

The CoCo 3 and the CM-8 monitor provide the best picture quality the CoCo has ever had — and *this benefit is realized even with existing CoCo programs* running on the CoCo 3. Comparing the CM-8 with what you get on a normal TV is like comparing night to day. However, there are some minor idiosyncracies in the CoCo 3's RGB output. One is the lack of artifact colors in PMODE 4 graphics intended to run on previous CoCos. These red and blue colors were caused by the dots in the display being misinterpreted by the TV or monitor's color circuits; this confusion just doesn't happen with RGB displays, so the dot patterns are now seen as dots instead of colors.

Also, for some reason the colors that the CoCo 3 provides are seen differently on the RGB monitor than they are on TV sets and composite monitors. Because of this, Extended BASIC includes the PALETTE RGB and PALETTE CMP (composite) commands that can be used to switch from one mode to the other. (The pictures of CoCo 3 graphics shown in this issue were taken from the CM-8 monitor, but the program was configured for composite monitors.)

The CM-8 monitor shows all the high-quality text and graphics the Color Computer 3 is capable of providing. However, those who want to use color composite monitors or TV sets with the new computer can do so, just as they did with previous CoCos. The CM-8 monitor can be added at any time.

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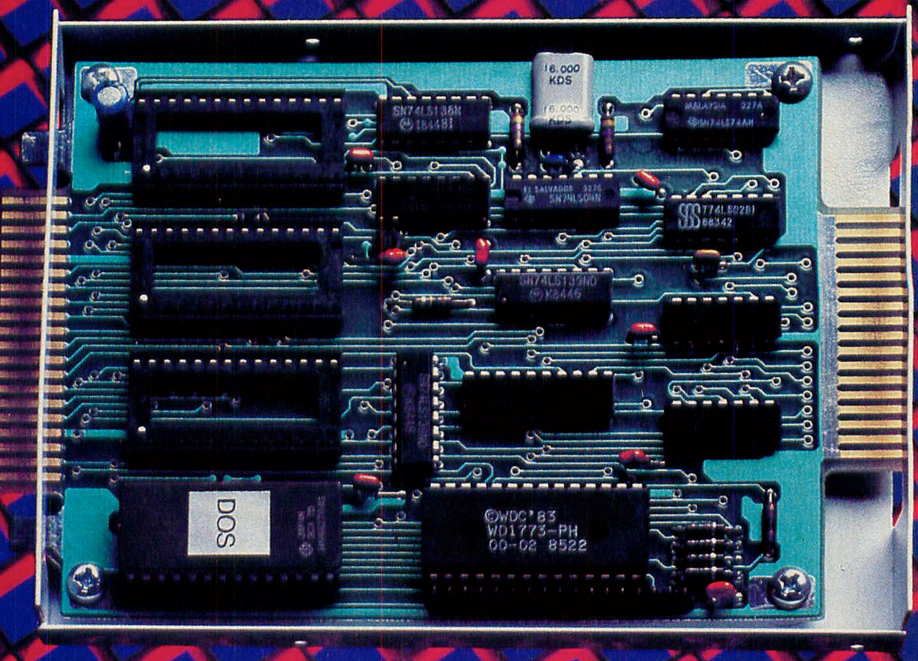

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The second is a Real Time Clock. This is a clock chip that will keep the proper time, date and year. A small battery keeps the time when the Computer is off, retreive and set the time by using simple Basic POKES. Also available with the Real Time Clock is the optional Centronics Compatible Parallel Printer adapter. Software to set the clock and printer driver included.

MPROM

The third is a Mini EPROM Programmer. Yes, a low cost programmer that attaches to the disk controller. A must for the DISTO Super Controller. Program those often used utilities into EPROM and plug them directly into your controller. Will program 2764's or 27128's, a perfect mate for the DISTO Super Controller.

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CREDITS:

The DISTO Super Controller, add-ons and all its documentation are conceived and designed by Tony Distefano. The DISTO Super Controller and add-ons are manufactured and distributed by; C.R.C. COMPUTER INC.
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New Commands Increase CoCo 3's Power

A standing-room-only crowd of about 300 was on hand in the Astor Salon of New York's Waldorf-Astoria Hotel, July 30, for Tandy's unveiling of five new computers, three printers and two new software products.

The announcement we'd been waiting for was the new CoCo 3. And, we were assured that with more than a million Color Computers out there already, Tandy fully intends to keep supporting our favorite machine. When you power up the new CoCo 3, you'll witness a whole new ball game!

The BASIC in the new machine is Microsoft Extended BASIC with enhancements by Microware. Upon turning the power on, all ROM is copied into RAM. This includes the disk controller ROM. This means you *must* have Disk Extended BASIC 1.0 or 1.1 in your controller. It also means that any programs that use the 96K method of switching ROMs in and out will not operate correctly on the Color Computer 3.

All this aside, we have had a chance to use the new Color Computer for a short period of time and thought you might be interested in some of the commands added to the system.

The new Hi-Res (320 by 192 and 640 by 192) graphics do not use up any memory in the BASIC memory area. They are controlled with the following new commands: `HBUFF`, `HCIRCLE`, `HCLS`, `HCOLOR`, `HDRAW`, `HPOINT`, `HGET`, `HLINE`, `HPAINT`, `HPUT`, `HRESET`, `HSCREEN` and `HSET`. Text is allowed on the graphics screens and is controlled with `HPRINT`, `HSTAT` and `LOCATE`. Also, you can select the 32-, 40- or 80-column text-screen with `WIDTH`.

You may choose from 64 colors on the new Color Computer 3. These are selected and manipulated with `ATTR`, `PALETTE` and the standard `CLS`.

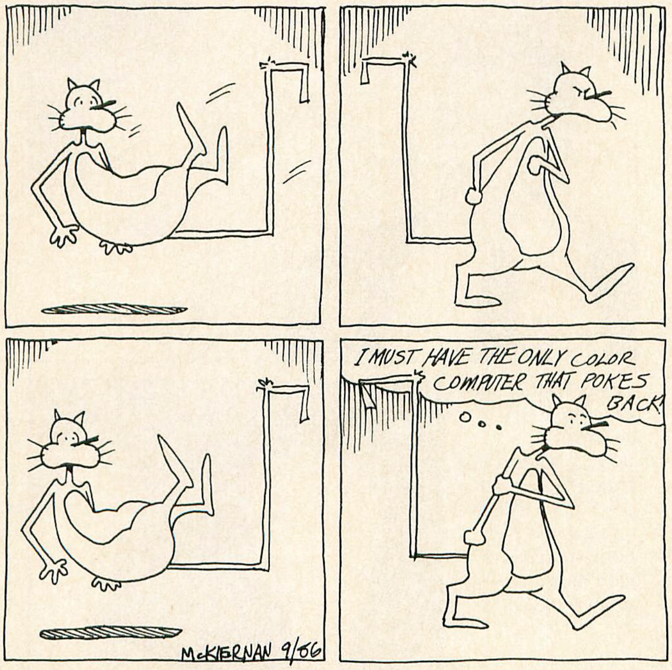
New error trapping as well as BREAK trapping commands are present: `ON BRK GOTO`, `ON ERR GOTO`, `ERLIN` and `ERNO`.

What we now know as "the 64K" is located in the memory map of the Color Computer 3 in locations $70000 to $7FFFF. To access other memory locations, the `LPOKE` and `LPEEK` commands have been added. What this means is that `PEEK(0)` returns a value from the same memory location as `LPEEK($70000)`. `LPEEK` and `LPOKE` allow us to access memory locations outside the "normal" 64K address space.

Finally, the Color Computer 3 software allows proper reading of both buttons on the Radio Shack Deluxe joysticks. The `BUTTON` function can be used to read each of four buttons (two on each of the left and right joysticks).

Keep in mind that these added commands do not replace the command set in the existing Extended BASIC. Rather, they complement it and allow for greater control of the Color Computer 3's new power and capabilities.

CoCo Cat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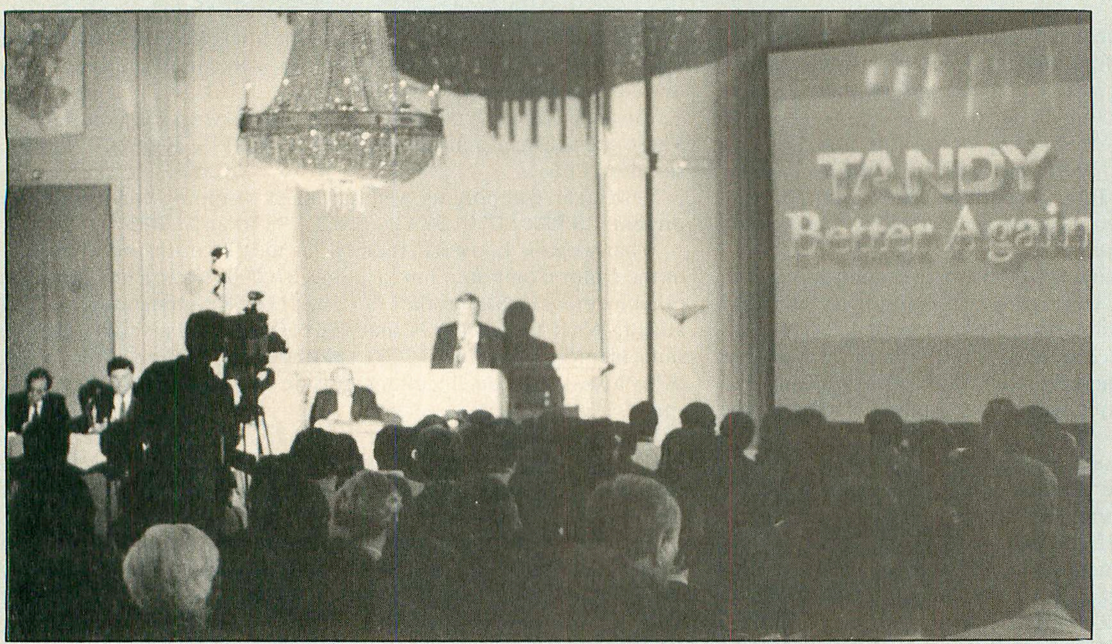
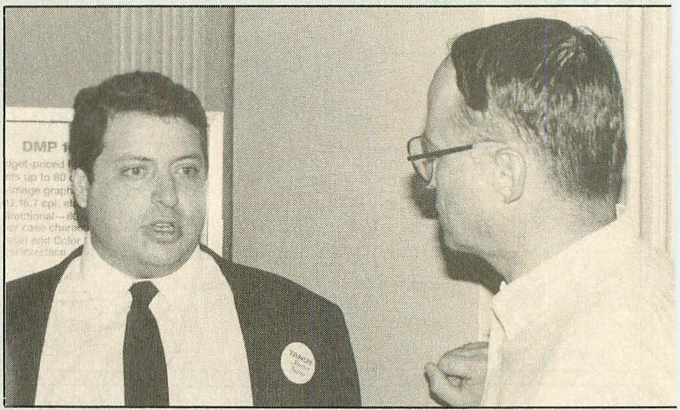


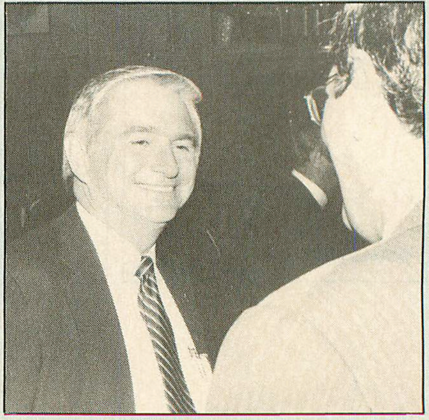
The CoCo 3 is unveiled to a packed house of news media representatives by Tandy Chairman John Roach in the Waldorf-Astoria Hotel in New York.

RAINBOW publisher Lonnie Falk uses a portable telephone to speed the news to Delphi's CoCo SIG.

Lonnie Falk and Microsoft Chairman Bill Gates compare notes after the news conference.

> *"Very impressive. This is an excellent, important upgrade to the CoCo. It will breathe new life into the CoCo Community. With the new graphics capability, software developers for rival machines will be very interested."*
>
> **— Jeff Parker**



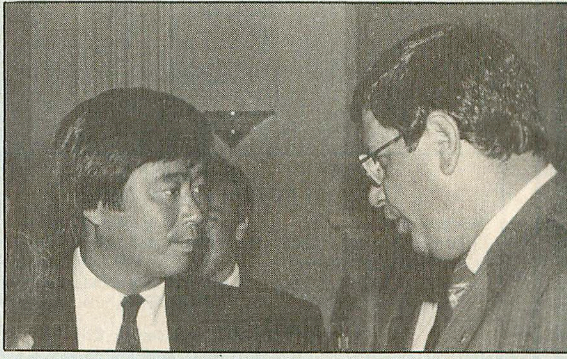


Tandy's Mark Siegel (above left) chats with RAINBOW columnist Dale Puckett while (left) John Roach and Lonnie Falk both are pleased with media reaction to CoCo 3.

Tandy staff (from left) Mark Siegel, Barry Thompson and Tana Grubb listen as CoCo 3 makes its debut.

"The resolution of the graphics screen is superb and the high-quality CM-8 color monitor is super! As a professional visual communicator, I think the possibilities are unlimited for the preparation of color transparencies for business presentations."

— Dale Puckett



Tandy's Mark Yamagata and Lonnie Falk go over CoCo 3 details.

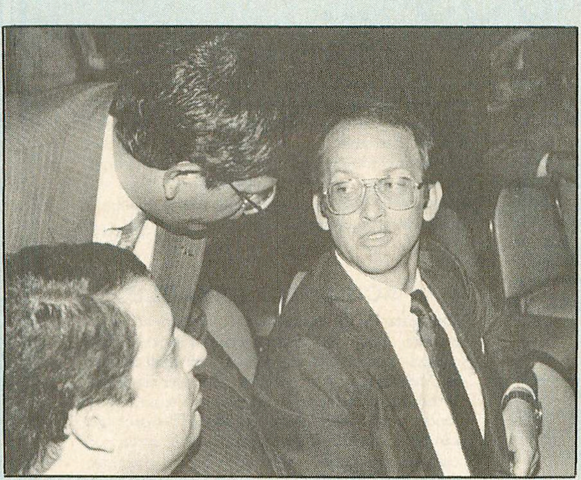
MOTD Editor Bruce Warner, CompuServe's Sandy Trevor and OS-9 Users Group President Brian Lantz listen to Tandy's Barry Thompson.

"I am impressed! I expected better graphics, but not this good; I expected more speed, but not this fast! I estimate the CoCo 3 will beat any IBM compatible by about 30 percent in execution time."

— Bruce Warner

"An exceptional machine and an exceptional value."

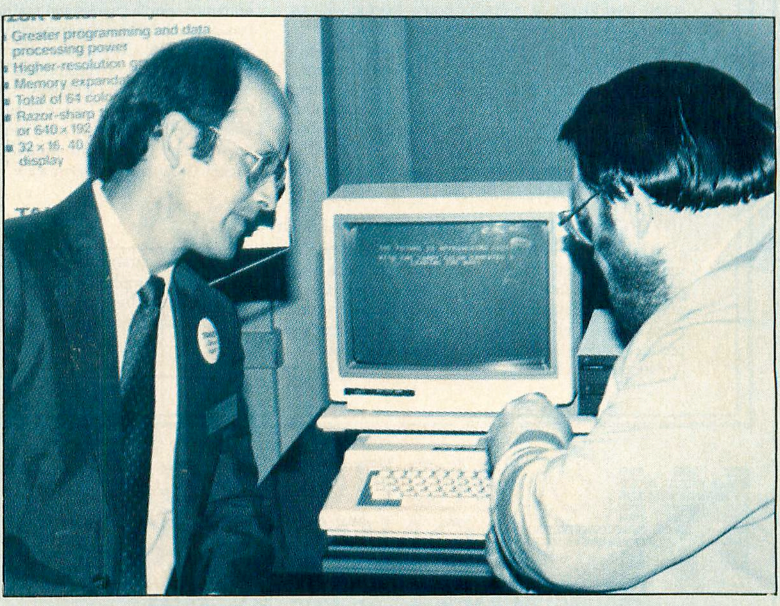
— Brian Lantz



"Are We Having Fun Yet?" Mark Siegel, Lonnie Falk and Barry Thompson confer minutes before CoCo 3's debut.

"The speed, graphics and power are stunning!"

— Bob Rosen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RAINBOW Managing Editor Jim Reed gets some CoCo 3 "hands on" while Tandy's Barry Thompson watches.

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- Execute OS-9 commands from within XTERM
- Definable macro keys
- Works with standard serial port, RS232 PAK, or PBJ 2SP Pack, Includes all drivers.
- Works with standard screen. XSCREEN, or WORDPAK 80 column board.

$49.95 with source **$89.95**

XMENU

Creates a menu driven environment for OS-9.

- Create your own menus
- Works with standard screen, XSCREEN, WORDPAK, O-PAK

$29.95 with source **$59.95**

XSCREEN

OS-9 hi-res screen

- 51/64/85 chars per line
- Easy menu operation

$19.95 with source **$39.95**

XDIR & XCAL

Hierarchial directory

- Full sorting
- Complete pattern matching

OS-9 calculator

- Decimal, Hex, Binary
- +, -, *, /, AND,OR, XOR, NOT

$24.95 with source **$49.95**

XDIS

OS-9 disassembler

$34.95 with source **$54.95**

XWORD

OS-9 word processing system

- Works with standard text screen, XSCREEN, WORDPAK, or O-PAK
- True character oriented full screen editing
- Full block commands
- Find and Replace commands
- Execute OS-9 commands from within
- Proportional spacing supported
- Full printer control, character size, emphasized, italics, overstrike, underline, super/sub-scripts
- 10 header/footers
- Page numbering in decimal or Roman numerals
- Margins and headers can be set different for even and odd pages

$69.95 with source **$124.95**

XMERGE

Mail merge capabilities for XWORD

$24.95 with source **$49.95**

XSPELL

OS-9 spelling checker, with 20000 and 40000 word dictionaries

$39.95

XTRIO

XWORD/XMERGE/XSPELL

$114.95 with XWORD/XMERGE source **$199.95**

XED

OS-9 full screen editor

$39.95 with source **$79.95**

AND FOR RS DOS ...

SMALL BUSINESS ACCOUNTING

This sales-based accounting package is designed for the non-accounting oriented businessman. It also contains the flexibility for the accounting oriented user to set up a double entry journal with an almost unlimited chart of accounts. Includes Sales Entry, transaction driven Accounts Receivable and Accounts Payable, Journal Entry, Payroll Disbursement, and Record Maintenance programs. System outputs include Balance Sheet, Income Statement, Customer and Vendor status Reports, Accounts Receivable and Payable Aging Reports, Check Register, Sales Reports, Account Status Lists, and a Journal Posting List. **$79.95**

INVENTORY CONTROL/SALES ANALYSIS

This module is designed to handle inventory control, with user defined product codes, and produce a detailed analysis of the business' sales and the sales force. One may enter/update inventory data, enter sales, run five sales analysis reports, run five inventory reports, set up product codes, enter/update salesman records, and update the SBAP inventory. **$59.95**

PAYROLL

Designed for maintaining personnel and payroll data for up to 200 hourly and salaried employees with 8 deductions each. Calculates payroll and tax amounts, prints checks and maintains year-to-date totals which can be automatically transferred to the SBA package. Computes each pay period's totals for straight time, overtime and bonus pay and determines taxes to be withheld. Additional outputs include mailing list, listing of employees, year-to-date federal and/or state tax listing, and a listing of current misc. deductions. Suited for use in all states except Oklahoma and Delaware. **$59.95**

These programs are user friendly and menu driven. Sample transactions are included. Each package features a hi-res screen. Each requires a printer, a minimum of 32k and at least 1 disk drive.

ACCOUNTS RECEIVABLE

Includes detailed audit trails and history reports for each customer, prepares invoices and monthly statements, mailing labels, aging lists, and an alphabetized customer listing. The user can define net terms for commercial accounts or finance charges for revolving accounts. This package functions as a standalone A/R system or integrates with the Small Business Accounting package. **$59.95**

ACCOUNTS PAYABLE

Designed for the maintenance of vendor and A/P invoice files. The system prints checks, voids checks, cancels checks, deletes cancelled checks, and deletes paid A/P invoices. The user can run a Vendor List, Vendor Status report, Vendor Aged report, and an A/P Check Register. This package can be used either as a standalone A/P system or can be integrated with the Small Business Accounting Package. **$59.95**

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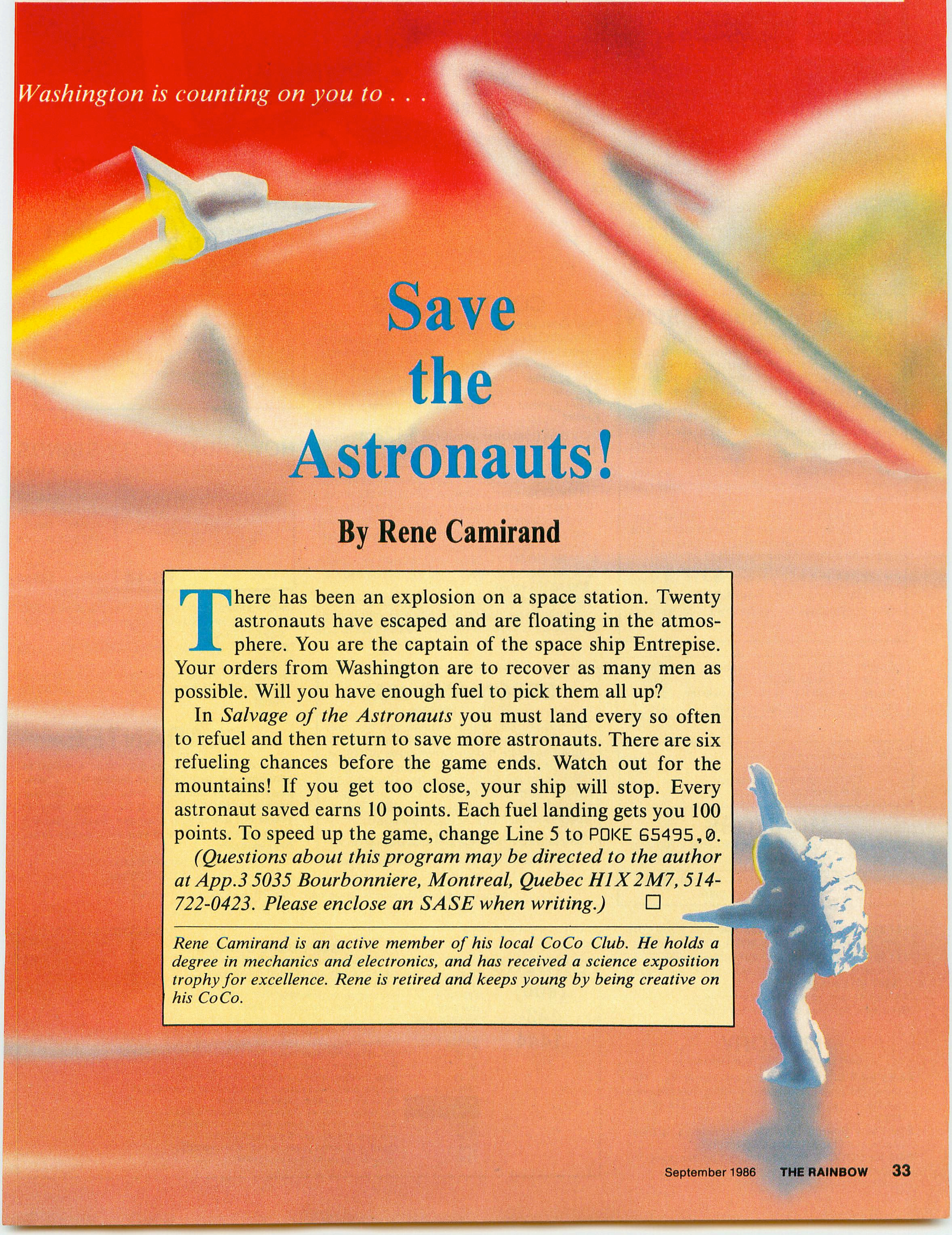

Washington is counting on you to . . .

Save the Astronauts!

By Rene Camirand

There has been an explosion on a space station. Twenty astronauts have escaped and are floating in the atmosphere. You are the captain of the space ship Entrepise. Your orders from Washington are to recover as many men as possible. Will you have enough fuel to pick them all up?

In *Salvage of the Astronauts* you must land every so often to refuel and then return to save more astronauts. There are six refueling chances before the game ends. Watch out for the mountains! If you get too close, your ship will stop. Every astronaut saved earns 10 points. Each fuel landing gets you 100 points. To speed up the game, change Line 5 to `POKE 65495,0`.

(Questions about this program may be directed to the author at App.3 5035 Bourbonniere, Montreal, Quebec H1X 2M7, 514-722-0423. Please enclose an SASE when writing.)

Rene Camirand is an active member of his local CoCo Club. He holds a degree in mechanics and electronics, and has received a science exposition trophy for excellence. Rene is retired and keeps young by being creative on his CoCo.

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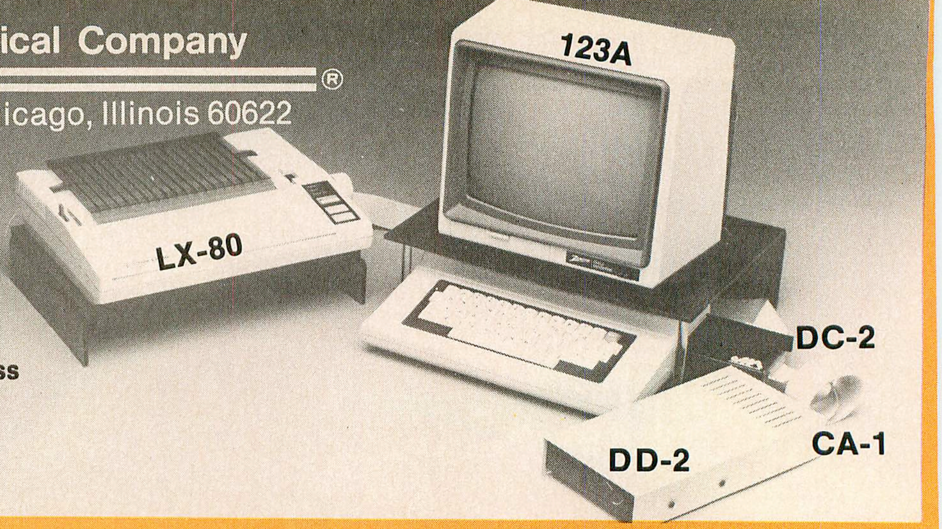

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New Dual Mode EPSON

The new Epson LX-80 offers printing flexibility in two modes: one mode allows you to print in a quick (100 cps) dot-matrix style for programming and graphics, and the Near Letter Quality mode (16 cps) produces precise (240 dots per inch), beautiful type for correspondence, reports, and similar purposes. The LX-80 offers 160 different type-style combinations, including Pica, Elite, Enlarged, Emphasized, Condensed, Subscripts and Superscripts, and type-styles can be selected quickly from the top control panel or from program control. Comes standard in friction feed; tractor option is also available.

LX-P package includes an LX-80, a serial interface, a Color Computer to Epson cable, and Printer Tutorial that teaches you how to program the different type styles ($29.95 value).

LX-P: LX-80 package $317 ($7 shpg)

ET-1 tractor option for LX-80. $29.50.

SF-1 Single-sheet feeder for the LX-80. $145 ($7 shpg)

Epson	RX-80 FT	repack	$207.
Epson	LX-80 New		$249.
Botek	Serial to parallel converter		$68.45
Howard	CoCo to Epson cable		$25.

DM-1	Disk mailer holds from one to five diskettes 200 lb. cardboard construction 25 mailers/box	$20.

MONITORS

123 Zenith 12" Green Screen, 640 dots x 200 dots resolution, 15 MHz band width. **$114** ($7 shpg)

123A Zenith 12" Green Screen Special, $67.50 ($7 shpg) *80 Column non glare*

122 Zenith 12" Amber Screen, 640 dots x 200 dots resolution, 15 MHz band width. **$117** (7 shpg)

141 Roland 13" Color Monitor with speaker, 270 dots x 200 dots resolution, 4MHz band width **$247** ($12 shpg)

All monitors require video controller.
Reverse video free with monitor order.

MEMORY

64K Upgrades—1 Year Warranty

64-E1 for E Boards with complete instructions. Remove old chips and replace with preassembled package—no soldering or trace cuts. **$28.45** ($2 shpg)

64-F1 for F Boards. No soldering needed. Capacitor leads must be cut. **$24.45** ($2 shpg)

64-2 for COCO 2. Kit requires one solder point, no trace cuts. **$24.45** ($2 shpg)

CONTROLLERS

New Controller from J&M: Has switch that allows either JDOS or RS DOS to be the disk operating system; eliminates software compatibility problems, while preserving the advantages of J&M's gold contacts and data separator. Also added to the DC-2 is a parallel port, which means a serial interface is no longer needed to make a parallel printer (like the Epson) work.

DC-2 Disk Controller with JDOS. **$128** ($2 shpg)

RS-1: RS DOS ROM Chip. $20.00 ($2 shpg)

DC-1 Disk Controller reads and writes to 35 and 40 track single and double-sided drives for *all* models of the Color Computer w/ JDOS. **$128** ($2 shpg)

VC-1 Video Interface mounts inside Color Computer by piggy-backing IC on top of interface—no soldering, no trace cuts. All models give composite video & sound. **$24.45** ($2 shpg)

VC-2 for COCO 2—mono only. **$26.45** ($2 shpg)

VC-3 for COCO 2—both color or monochrome **$39.45** ($2 shpg)

VC-4 for new Color Computer (no sockets, chips are soldered to mother board). Attaches with spring-loaded clips. Color or mono. **$39.45** ($2 shpg)

EPSON AND J&M

The EJ-P Package

The Epson LX-80 Printer teamed with our new J&M DC-2 Controller gives you top printing capabilities *plus* built-in switch gives JDOS or Radio Shack DOS so all software can run on your Color Computer. Package includes: Epson LX-80 Printer with ET-1 tractor; DC-2 controller; parallel Color Computers to J&M cable; Epson Printer Tutorial ($29.95 value).

Complete EJ-P package $425.00 ($7 shpg)

DD-2	Double sided 360K disk with ½ height case & heavy duty power supply	$188.
CA-1	Disk drive cable	$24.50
CA-2	Two drive cable	$29.50
DE-1	Disk enclosure ½ height with power supply	$58.

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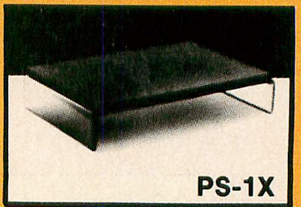

New TS-1X Monitor Stand: Designer-beautiful stand with clear corner posts, easy side access to ROM port, reset and on/off buttons. **$39.50** ($3 shpg)

TS-1: Standard 13" monitor stand for the original Color Computer. Specify black, ivory or clear. 15"×11"×4". **$29.50** ($3 shpg)

TS-2: Same as above for the COCO 2. **$29.50** ($3 shpg)

PS-1X Printer Stand features new noise-suppressing foam top and cork base. 15"×11"×2½". **$24.95** ($3 shpg)

GUARANTEE

Howard Medical's 30-day guarantee is meant to eliminate the uncertainty of dealing with a company through the mail. Once you receive our hardware, try it out; test it for compatibility. If you're not happy with it for any reason, return it in 30 days and we'll give you your money back, (less shipping).

Hours: 8:00-4:00 Mon.-Fri.
10:00-3:00 Sat.

Software system requirements: CoCo with 1 disk, 32K RAM, 80-column printer
Add $2 for shipping.

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LEDGER free with PAYROL/BAS	Prints checkbook with up to 30 user definable ledger numbers a $39/VALUE
	WITH PAYROL/BAS YOU WILL ALSO WANT
STATE TAX 39.95	Automatically calculates state withholding including graduated taxes. TABLES ALREADY ENTERED
941 29.95	Prints totals by quarter per employee Ideal for Federal 941 and state unemployment
CHECKS	500 pin-feed checks specify blue green or brown $57.25
VIP LIBRARY $125	Softlaw's integrated package includes VIP Write, terminal, Database, Speller and CALC
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THE RAINBOW features more programs, more information and more in-depth treatment of the Tandy Color Computer than any other source.

A monthly issue contains 260 or more pages and two dozen programs, 15 regular columns and as many as 20 product reviews. And advertisements: **THE RAINBOW** is known as *the* medium for advertisers — which means every month it has a wealth of information unavailable anywhere else about new products! Hundreds of programs are advertised in its pages each month.

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Every single issue of **THE RAINBOW** covers the wide spectrum of interests in the Tandy Color Computer — from beginners' tutorials and arcade games to telecommunications and business and finance programs. Helpful utilities and do-it-yourself hardware projects make it easy and fun to expand your CoCo's capabilities. And, monthly reviews by independent reader reviewers take the guesswork out of buying new software and hardware products.

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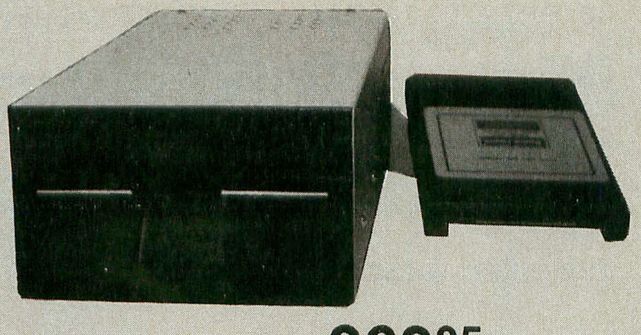

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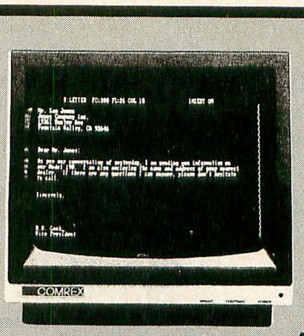
One double sided drive with doubler board and new RS controller so you can have the equivalent of 2 drives in one. You can even backup from 0 to 1. Works with all CoCo's.



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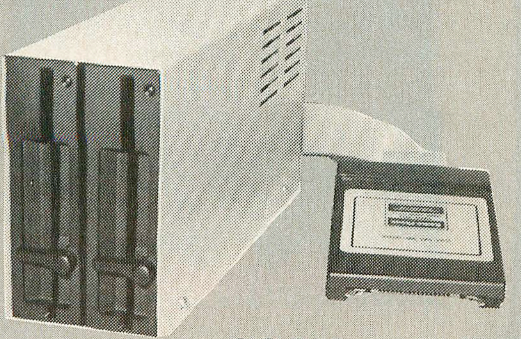
Epson's Comrex 5650 has a 12" screen with 900 lines. Resolution for 80 column text and 18 MHZ band width, retail price was 139.95. 13" Color Monitor (not shown), now only $139.95. These are new, in factory sealed cartons, NOT used, repacked, or refurbished. Add 7.00 s/h. Monitor Interface for any color Computer 29.95.



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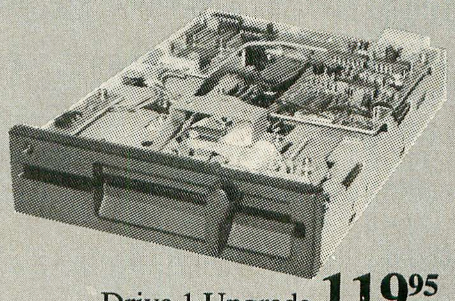

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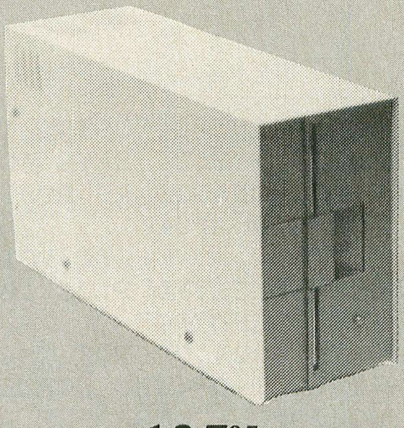

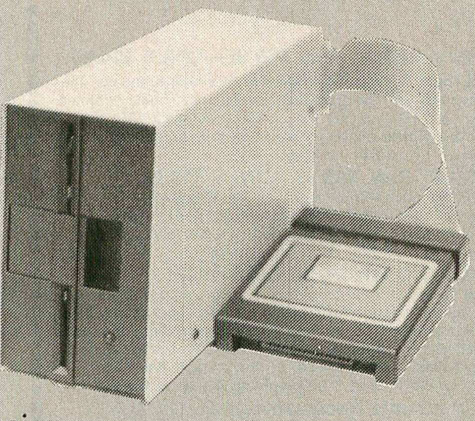

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```
170 ......228
300 .......62
550 .......70
END ......36
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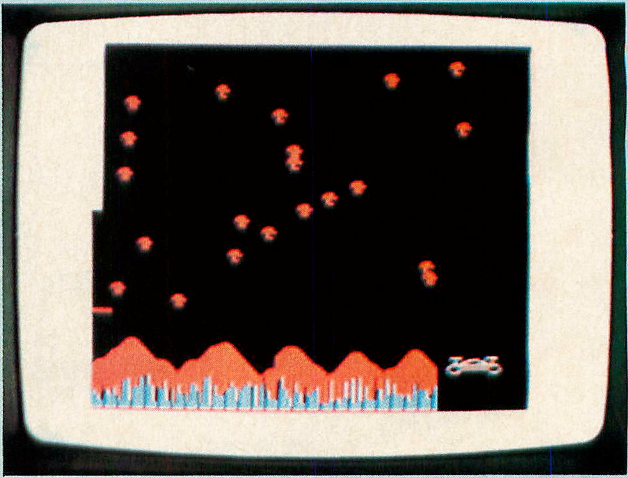
The listing: ASTRONAT

```
5 POKE 65494,0
10 CLS:PRINT@2,"****************
***********"
20 PRINT@34,"** SALVAGE OF ASTRO
NAUTS **"
30 PRINT@66,"**":PRINT@91,"**"
40 PRINT@98,"**             BY
      **"
50 PRINT@130,"**":PRINT@155,"**"
60 PRINT@162,"**       RENE CAMIRA
ND       **"
70 PRINT@194,"**":PRINT@219,"**"
80 PRINT@226,"**       MONTREAL P.
Q.       **"
90 PRINT@258,"**":PRINT@283,"**"
100 PRINT@290,"*****************
**********"
110 PRINT@333,"COPY RIGHTS REG."
120 PRINT@448,"PRESS ANY KEY FOR
 INST."
130 EXEC 44539
```



```
140 CLS:PRINT@0,"USING THE SHIP
<ENTREPISE> YOU  HAVE TO SAVE AS
 MANY ASTRONAUTS AS POSSIBLE WIT
HOUT MISSING FUEL
                 GET POINTS FOR
ASTRONAUTS SAVED PLUS 100POINTS
FOR FUEL LANDING"
150 PRINT@224,"CKECK THE FUEL GA
UGE AT LEFT OF THE SCREEN <NO FU
EL: NO GO>      USE THE RIGHT JST
K FOR MOVING"
160 PRINT@352,"YOU HAVE<6>FUEL L
ANDING TO SCORETHE MOST POINTS.T
HEN IT END"
170 PRINT@448,"PRESS ANY KEY FOR
 ACTION"
180 EXEC44539
190 DIMZ(42,12):DIM L$(50)
200 CLS:BB=0
210 PRINT@70,"1-  SLOW":PRINT@19
8,"2-  MEDIUM":PRINT@326,"3-  FA
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```
ST":PRINT@448,"--->  YOUR CHOICE
 ?"
220 B$=INKEY$:IF B$=""THEN220 EL
SE IF B$="3" THEN GOTO 250 ELSE
IF B$="2" THEN GOTO 240 ELSE IF
B$="1" THEN GOTO 230 ELSE GOTO22
0
230 BB=1:GOTO 260
240 BB=1.25:GOTO 260
250 BB=1.5:GOTO260
260 PMODE3,1:PCLS:SCREEN1,0:POKE
 179,0
270 QQ=0
280 POKE 178,2
290 DRAW"BM0,168E4R4E6R3E6R2F12R
6F8E8R6E8R4E2R2F18R4E4R4U6E6R3F1
0R3F5R4E12R2F6R3F6E3R4E10R2F10D2
6":REM:PAINT(2,170),4,4
300 POKE179,4:PAINT(2,170)
310 FORB=0TO200 STEP2:LINE(B,190
-RND(18))-(B,190),PRESET:NEXTB
320 PMODE4,1:SCREEN1,1
330 FORT=8TO130 STEP6
340 L$="S"+STR$(RND(5)+1)+"BM"+S
TR$(RND(220)+10)+","+STR$(T)+"S4
;R3D1L5D1R7BL2L5BR2R3BL3D1R2D1L2
D1R3"
350 POKE178,2
360 DRAW L$:NEXTT
370 DRAW"BM0,136R10D1L10"
380 PMODE4,1
390 DRAW"S4;BM221,167R22F2G2L2BL
5BU2L14G2BE2H2BF2BG2L4H2E2R3U4R3
L6R3D4R2E1R2U1R2E1R2BR1R2F1R2D1R
2F1R2U4R3L6R3D4L2D1G1F2R1"
400 X=223 :Y=162
410 GET(X-14,Y-6)-(X+28,Y+14),Z,
G
420 A=223:B=162
430 A1=A:A=A+INT(JOYSTK(0)/6)-5
440 B1=B:B=B+INT(JOYSTK(1)/6)-5
450 IFA OR B=LEN(A$) THEN P=P+1
460 QQ=QQ+BB:LINE(0,0)-(5,QQ),PS
ET,BF:IF QQ=135THEN GOTO 600 ELS
E480
470 IF B>=185 THEN U=U
480 IF B>=185 THEN 570
490 IF A<=214 AND B=>140 THEN A=
A1:B=B1
500 IF B=<10 THENB=10
510 IFA>=217 THEN A=217
520 IF A=<20 THENA=20
530 IF A=>205 AND B<186 THEN GOT
O 550
540 IF A=>205 AND B=>186 THEN B=
B1:GOTO550
550 PUT(A-14,B-6)-(A+28,B+14),Z,
PSET:Z=0
560 GOTO 430
570 CLS:P=P+100:PRINT@139,"SCORE
 :";   P;:PRINT@390,"FELICITATIO
N FOR THAT                FUEL LA
NDING"
580 K=1000:IFU=5THEN K=1000
590 FORT=1TOK:NEXTT:U=U+1:IFU=6T
HEN620 ELSE GOTO260
600 CLS:SCREEN1,0:PRINT@130,"SOR
RY MAN YOUR A DEAD DUCK":PRINT@2
90,"I TOLD YOU <NO FUEL><NO GO>
                     <NO POINTS>"
610 FORT=1TO3000:NEXTT:P=0:GOTO6
30
620 PRINT@203,"FINAL SCORE":PRIN
T@295,"HOURRA !! CHAMPION !!":FO
RT=1TO2500:NEXTT
630 CLS:PRINT@232,"ANOTHER GAME
?":PRINT@458,"< Y / N >"
640 WW$=INKEY$:IF WW$=""THEN640
ELSE IF WW$="N" THEN 660 ELSE 65
0
650 P=0:U=0:GOTO 200
660 CLS:PRINT@162," HOPE YOU HAD
 A GOOD GAME ":PRINT@290,"  BYE!
...BYE!...":FORT=1TO2000:NEXTT:P
OKE113,3:EXEC40999
```

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Rational Thinking

Ratios is a hands-on exercise in converting fractions to ratios and percentages; the sort of exercise which enables a pupil to increase familiarity and skill by means of unlimited repetition.

If you enter the numerator and the denominator of a fraction, you have control over the level of difficulty. If you let CoCo enter random numerators and denominators, the level of difficulty is controlled by the magnitude of the numerator you choose (Line 370). In either case, the numerator is restricted to two digits and the denominator to three, which keeps the program within the ability limits of a disadvantaged pupil. Increase the level of difficulty by changing the values of `LEN(A$)` and `LEN(B$)` in lines 130 and 140 and `VAL(CR$)` in Line 370. After five attempts, you are given the choice of entering your numbers or random numbers again.

In entering answers to questions, you are restricted to seven characters including a decimal. Illegal entries are erased and a new entry can be made. The instructions ask you not to type the percent (%) sign because this is added to your answer.

After an answer has been entered, the screen shows either `RIGHT` or `WRONG` and the correct answer in both cases. The entries in lines 50 and 60 ensure that CoCo's correct answer (`P$`) is the same length as your correct answer (`E$`). If you enter 33.3 as the percentage equivalent of $^{1}/_{3}$, then you get `ANSWER WAS 33.3%`. If you enter 33.3333, then CoCo's correct answer will be 33.3333%. If your answer is wrong, then CoCo's correct answer may vary in length. This is followed by an `X RIGHT OUT OF Y` message and a score expressed as a ratio and a percentage in keeping with the theme of the exercise.

All the subroutines are at the beginning of the listing in lines 20 through 220. This should make it easier if you want to use them in your own programs. Change Line 20 to read `X=A/B` and Line 190 to read `PRINT@162,STRING$(L,"-")"=";:RETURN` and you have a basis for using the fraction for division exercises beginning at Line 240. Note that lines 180 and 190 ensure the fraction line has the length of whichever of the two, numerator or denominator, is longer.

Keiran Kenny lives in The Hague, Holland, and began programming after seven years of retirement. He holds a degree in modern European languages, and has a special interest in the graphics and math possibilities of the CoCo.

(Questions about this program may be directed to the author at van Montfoortlaan 31, 2296 SP The Hague, Holland. Please enclose an SASE when writing.) ☐

140	214
260	30
400	113
550	86
660	141
730	153
END	93

The listing: RATIOS

```
10 CLS:GOTO230
20 X=B/A:GOTO40
30 X=(A/B)*100
40 X$=STR$(X)
50 E$=STR$(E):EX=LEN(E$)-LEN(STR
$(INT(E)))
60 IFE=INT(E)ANDX<>INT(X)THENP$=
LEFT$(X$,5)ELSEP$=LEFT$(X$,LEN(S
TR$(INT(X)))+EX)
70 RETURN
80 IFE$=P$THENR=R+1:PRINT@268,"R
IGHT!":A$="ANSWER WAS"+P$:PRINT@
303-INT(LEN(A$)/2),A$;:IFQ=1THEN
PRINT"%":GOTO100ELSE100
90 IFE$<>P$THENWR=WR+1:PRINT@268
,"WRONG!":A$="ANSWER WAS"+P$:PRI
NT@303-INT(LEN(A$)/2),A$;:IFQ=1T
HENPRINT"%"
100 A$=STR$(R)+" RIGHT OUT OF"+S
TR$(R+WR)+" "+CHR$(8):PRINT@336-
INT(LEN(A$)/2),A$+"!"
110 IFR>0THENE=(R+WR)/R:IE$="THA
T IS 1 :"+LEFT$(STR$(E),5)+" OR"
+LEFT$(STR$(R/(WR+R)*100),6)+"%"
:PRINT@367-INT(LEN(IE$)/2),IE$
120 RETURN
130 LINEINPUTA$:A=VAL(A$):IFA<>I
NT(A)ORLEN(A$)>2THENPRINT@130,CH
R$(31):PRINT@130,"";:GOTO130ELSE
RETURN
140 LINEINPUTB$:B=VAL(B$):IFB<>I
NT(B)ORLEN(B$)>3THENPRINT@194,CH
R$(31):PRINT@194,"";:GOTO140ELSE
RETURN
150 LINEINPUTC$:IFLEN(C$)>7THENP
RINT@160+L+9,CHR$(8):PRINT@160+L
+9,"";:GOTO150ELSEC=VAL(C$):RETU
RN
160 LINEINPUTD$:IFLEN(D$)>7THENP
RINT@160+L+LC+12,CHR$(31):PRINT@
160+L+LC+12,"";:GOTO160ELSED=VAL
(D$):RETURN
170 FORX=P TO P2STEP32:PRINT@X,C
HR$(31):NEXT:RETURN
180 IFLEN(A$)>LEN(B$)THENL=LEN(A
$)ELSEL=LEN(B$)
190 PRINT@162,STRING$(L,"-")" =
1 :";:RETURN
200 FORD=1TO1500:NEXT:RETURN
210 PRINT@487,"PRESS ANY KEY.";
220 K$=INKEY$:IFK$=""THEN220ELSE
RETURN
230 CLEAR200
240 PRINT@139,"<RATIOS>",,,,"BY
 KEIRAN KENNY, THE HAGUE, 1985"
250 PRINT@320,"<ENTER> YOUR NAME
, PLEASE (MAX. 14 CHARACTERS==>"
;:LINEINPUTNM$
260 IFLEN(NM$)>14THENP=320:P2=41
6:GOSUB170:GOTO250
270 PRINT@422,"INSTRUCTIONS? Y/N
";
280 GOSUB220
290 IFK$="Y"THENCLS:GOTO640
300 IFK$="N"THENCLS:GOTO320
310 GOTO280
320 PRINT@128,"MAKE YOUR CHOICE:
":PRINT:PRINTTAB(5)"rANDOM NUMBE
RS, OR":PRINT:PRINTTAB(5)"eNTER
YOUR OWN NUMBERS.":PRINT:PRINTTA
B(5)"PRESS <R> OR <E>:";
330 GOSUB220
340 IFK$="R"THENX=RND(-TIMER):V=
1:PRINT"R":GOTO370
350 IFK$="E"THENV=0:CLS:GOTO380
360 GOTO330
370 PRINT:W$=NM$+" WANTS A NUMER
ATOR":PRINT@400-LEN(W$)/2,W$:PRI
NT@456,"NO LARGER THAN:";:LINEIN
PUTCR$:IFVAL(CR$)<1ORLEN(CR$)>2T
HENP=448:P2=448:GOSUB170:PRINT@4
48,"";:GOTO370ELSEGOSUB200:CLS:G
OTO400
380 CLS:IFK$="E"ORK$="Y"THENPRIN
T@32,"ENTER NUMERATOR (THE TOP N
UMBER IN A FRACTION)."
390 PRINT@130,"";:GOTO410
400 IFK$="R"ORK$="Y"THENA=RND(VA
L(CR$)):A$=RIGHT$(STR$(A),LEN(ST
R$(A))-1):PRINT@130,A$:GOTO440
410 GOSUB130:P=32:P2=64:GOSUB170
420 PRINT@32,"ENTER DENOMINATOR
(THE BOTTOM   NUMBER)."
430 PRINT@194,"";:GOTO460
440 B=A+RND(VAL(CR$))
450 B$=RIGHT$(STR$(B),LEN(STR$(B
))-1):PRINT@194,B$:GOSUB180:GOTO
490
460 GOSUB140:GOSUB180
470 IFB<A THENPRINT@224,"TOO SMA
LL! TRY AGAIN!":GOSUB200:P=194:P
2=224:GOSUB170:GOTO430
480 P=32:P2=64:GOSUB170
490 PRINT@32,"ENTER NUMBER AFTER
 COLON (WITH  DECIMAL WHERE NECE
SSARY).
500 PRINT@160+L+9,"";:P=320:GOSU
B150:E=C
510 GOSUB20:GOSUB80
520 PRINT@32,"ENTER THE EQUIVALE
NT PERCENTAGE (WITH DECIMALS IF
NECESSARY)."
530 LC=LEN(C$):PRINT@160+L+LC+10
,"= ";:GOSUB160:PRINT@160+L+LC+1
1+LEN(STR$(D)),"%":E=D
540 GOSUB30:P=256:P2=352:GOSUB17
0:Q=1:GOSUB80
550 PRINT@457,"ANOTHER? Y/N"
560 GOSUB220
570 IFK$="Y"AND(R+WR)/5=INT((R+W
R)/5)THENQ=0:CLS:GOTO320
580 IFK$="Y"ANDV=1THENCLS:Q=0:GO
TO400
590 IFK$="Y"ANDV=0THENQ=0:GOTO38
0
600 IFK$="N"THENCLS:GOTO620
610 GOTO560
620 TK$="THANKS "+NM$+"!":PRINT@
112-INT(LEN(TK$)/2),TK$:PRINT@16
0," I HOPE YOU LIKED THE TEST AN
D   LEARNED SOMETHING FROM IT.":
PRINT@455,"TO END PROGRAM":GOSUB
210
630 CLS:END
640 PRINT@7,"***INSTRUCTIONS***"
:PRINT@32,"GIVEN THE NUMERATOR (
THE TOP     NUMBER) OF A FRACTION
 LIKE THIS:":PRINT@101,CHR$(159)
:GOSUB200
650 PRINT@100,3:GOSUB200:PRINT@8
6,CHR$(31):PRINT@85,";"
660 PRINT@96,"THEN THE DENOMINAT
OR (BOTTOM     NUMBER), LIKE THIS
:":PRINT@164,3:PRINT@197,"-":PRI
NT@229,CHR$(159):GOSUB200
670 PRINT@228,4:GOSUB200:PRINT@1
35,CHR$(31):PRINT@135,";"
680 PRINT@160,"<ENTER> THE NUMBE
R AFTER THE     COLON (':') LIKE
THIS:":PRINT@228,3:PRINT@261,"-
= 1 : "+CHR$(159):PRINT@292,4:GO
SUB200
690 PRINT@268,1.33:GOSUB200:PRIN
T@204,CHR$(31):PRINT@203,";"
700 PRINT@224,"AND THEN CONVERT
THE FRACTION    INTO A PERCENTAGE
 LIKE THIS:":PRINT@292,3:PRINT@3
25,"- = 1 : 1.33 = "+CHR$(159):P
RINT@356,4:GOSUB200
710 PRINT@340,"75%":PRINT@416,"I
'M NOT GOING TO TELL YOU HOW TOD
O YOUR ARITHMETIC!":K$=INKEY$:GO
SUB210
720 CLS:PRINT@0,"YOU CAN <ENTER>
 YOUR OWN NUMBERSABOVE AND BELOW
 THE LINE OR LET THE COMPUTER EN
TER A NUMERATOR  AND A DENOMINAT
OR AS RANDOM     NUMBERS. IN THI
S CASE YOU CAN   CHOOSE THE HIGH
EST VALUE FOR THENUMERATOR (MAXI
MUM 99)."
730 PRINT:PRINT"BEGIN WITH SMALL
 NUMBERS AND TRYTO CALCULATE THE
 ANSWERS IN YOURHEAD AS AN EXERC
ISE IN MENTAL    ARITHMETIC. TRY
LARGER NUMBERS  TOO AS AN EXERCI
SE IN USING YOURCALCULATOR OR IN
 MAKING CALCUL- ATIONS ON PAPER.
":GOSUB210
740 CLS:PRINT@0,"<ENTER> NUMBERS
 AS FOLLOWS:":PRINT:PRINT"NUMERA
TOR, 1-2 DIGITS, NO DECI- MAL. M
AXIMUM 99;"
750 PRINT:PRINT"DENOMINATOR, 1-3
 DIGITS, NO DEC-IMAL. MAXIMUM 99
9;"
760 PRINT:PRINT"ANSWERS, MAXIMUM
 WITH DECIMAL   SEVEN CHARACTERS
. DO NOT TYPE   THE '%' SIGN."
770 PRINT:PRINT"ILLEGAL ENTRIES
WILL SELF-ERASE AND YOU CAN TRY
AGAIN!"
780 GOSUB210:CLS:GOTO320
```

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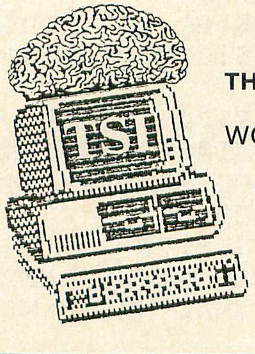

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Keiran Kenny

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Display uses the `SET` command to put the message of your choice on the screen to attract attention to your store display, garage sale or what have you. It displays in big letters using all the colors CoCo has to offer. The horizontal and vertical `SET` values for most characters are in `DATA` lines 100, 110, 120 to 210 and 220 to 470. The data in lines 500 to 510 set the starting and finishing sequence number for each character as in data lines 100 to 470.

The character set includes the dollar sign, hyphen, numbers zero through nine and the letters A to Z. In addition, lines 550 to 570 in subroutine 540 set the coordinates for the period (.), spacebar and the exclamation (!) sign. These characters have spacing requirements which differ from the other characters.

The screen has four text lines and you can put up to eight letters or numbers in each line. As in Line 990, you can also get away with seven letters or numbers plus a space and two punctuation signs.

To put text on the screen, follow the examples beginning at Line 690. PP is the horizontal coordinate at which text begins. For a line consisting of eight letters or numbers you need PP equal to zero but, for less, you can vary the value of PP in order to center your text. The lines are numbered one to four from top to bottom and the line number is labeled LL. The vertical position of the lines cannot be varied.

You have nine choices of color established by the variable CC: the familiar one through eight colors, and nine, which gives the multicolored effect as in the words RAINBOW in Line 690 and COLOR T.V. in Line 990. Actually there is another choice, `CC=RND(8)`, which gives (usually) a different but uniformly colored word each time you repeat the display. I have not used it here because I prefer to choose my colors rather than leave them to chance. Your text is put into a string labeled `W$` followed by `GOSUB 540`.

Keiran Kenny lives in The Hague, Holland and began programming after seven years of retirement. He holds a degree in modern European languages, and has a special interest in the graphics and math possibilities of the CoCo.

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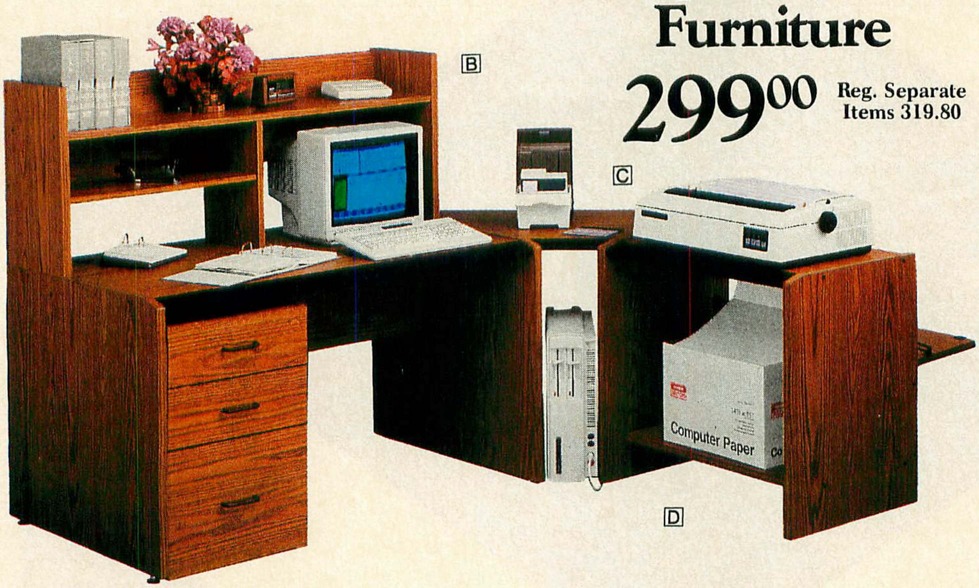

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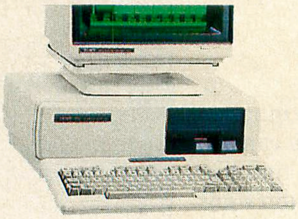

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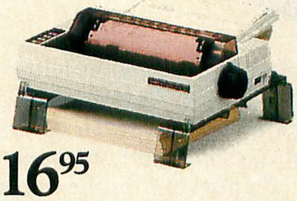

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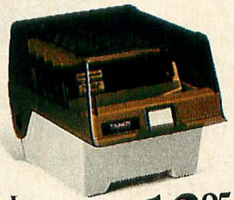

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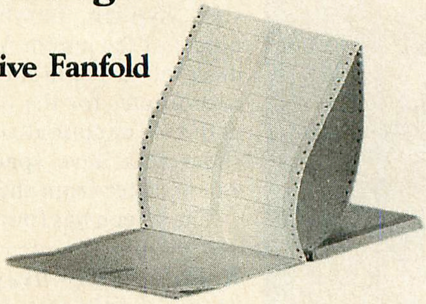

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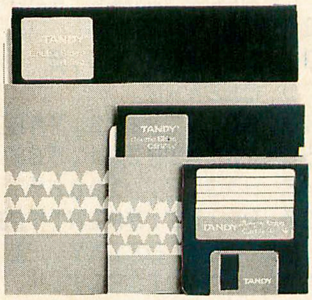

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To erase a line, enter the line number, `LL` and `GOSUB 530`. In the program, by way of example, the eraser is used to erase lines one at a time by means of separate entries or, as in Line 800, three at a time using a loop.

I have tried to ensure that *Display* will also fit a 16K ECB machine. Thus, in Line 30, I took as many bytes as I could from CoCo's statutory 200 bytes reserved for string space. If you get an OS Error when trying to save the program, then increase the `CLEAR8` in Line 30 to a slightly higher number.

Be very careful when you type the `DATA` lines 100 to 470 and 500 to 510, especially with the commas, which represent zero. If you make a mistake in typing you should get a DATA Error message, but that is not always completely reliable. You could type a two for a three and then a three for a two a few values later and the checksum remains correct. Your best guide is the appearance of the letters and numbers themselves. If you find a blob sticking out where it obviously should not be, then check the `DATA` line for the offender. Each character has its own line in numerical or alphabetical order.

If you do not have Extended Color BASIC, then I hope you have *Little E* [October 1984, Page 119] so you can edit any necessary corrections into a line instead of having to retype the whole line.

Note the high speed `POKE` in Line 20. If your CoCo cannot take it, delete or leave it out.

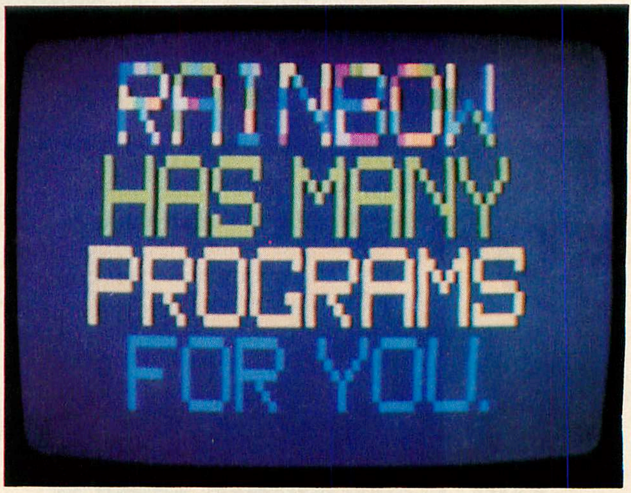
In the demonstration program, the two displays keep on repeating. This ensures some movement on the screen and that is what attracts notice and holds attention. Movement can be anything, like erasing or entering lines, but it must be slow enough to be perceptible. I think the speed in this program, with or without the high speed `POKE`, is just about right.

(You may direct questions about this program to Mr. Kenny at van Montfoortlaan 31, 2296 SP The Hague, Holland. Please enclose an SASE when writing.) ☐

130	208	520	84
210	236	630	38
280	49	770	57
360	147	900	18
440	128	END	182

The listing: `DISPLAY`

```
0 '16K ECB PCLEAR1 BEFORE YOU
   LOAD THIS PROGRAM.
10 CLS
20 POKE65495,0
30 CLEAR8
40 PRINT@138,"*DISPLAY*"
50 PRINT@224,"BY KEIRAN KENNY, T
HE HAGUE, 1986"
60 PRINT:PRINT"PLEASE EXCUSE THE
 SLIGHT DELAY. I HAVE A LOT OF D
ATA TO DIGEST!"
70 DIM H(678),V(678),A(38),B(38)
80 FORI=1TO678:READHH,VV:H(I)=HH
:V(I)=VV:DE=DE+HH+VV:NEXT
90 IFDE<>3895THENPRINT:PRINT"DAT
A ERROR LINES 100-470!":STOP
99 '$
100 DATA 3,,,1,1,1,2,1,3,1,4,1,5
,1,6,1,,2,3,2,,3,1,3,2,3,3,3,3,4
,4,3,5,3,6,3,6,4,6,5,5,5,4,5,3,5
,3,6,2,5,1,5,,5
109 '-
110 DATA 2,4,3,4
119 '0-9
120 DATA 2,,3,,4,,1,1,5,1,,2,6,2
,,3,6,3,,4,6,4,1,5,5,5,2,6,3,6,4
,6
130 DATA 3,,2,1,3,1,3,2,3,3,3,4,
3,5,3,6,2,6,4,6
140 DATA ,1,1,,2,,3,,4,,5,1,6,2,
5,3,4,4,3,4,2,4,1,4,,4,,5,,6,1,6
,2,6,3,6,4,6,5,6,6,6
150 DATA ,1,1,,2,,3,,4,,5,1,6,2,
5,3,4,3,3,3,6,4,5,5,4,6,3,6,2,6,
1,6,,5
160 DATA ,,,1,,2,,3,,4,,5,1,5,2,
5,3,5,4,5,4,4,4,6,5,5,6,5
170 DATA ,,1,,2,,3,,4,,5,,,1,,2,
1,2,2,2,3,2,4,2,5,3,6,4,5,5,4,6,
3,6,2,6,1,6,,5
180 DATA 6,1,5,,4,,3,,2,,1,,,1,,
2,,3,1,3,2,3,3,3,4,3,5,3,6,4,6,5
,5,6,4,6,3,6,2,6,1,6,,5,,4
190 DATA ,,1,,2,,3,,4,,5,,6,,6,1
,5,2,4,3,3,4,2,5,1,6
200 DATA 1,,2,,3,,4,,5,,6,1,6,2,
5,3,4,3,3,3,2,3,1,3,,4,,5,1,6,2,
6,3,6,4,6,5,6,6,5,6,4,,1,,2
210 DATA 1,,2,,3,,4,,5,,6,1,6,2,
```



```
6,3,5,3,4,3,3,3,2,3,1,3,,2,,1,6,
4,6,5,5,6,4,6,3,6,2,6,1,6,,5
219 'A-Z
220 DATA ,6,,5,,4,,3,,2,,1,1,,2,
,3,,4,,5,,6,1,6,2,6,3,5,3,4,3,3,
3,2,3,1,3,6,4,6,5,6,6
230 DATA ,,1,,2,,3,,4,,5,,6,1,6,
2,5,3,4,3,3,3,2,3,1,3,6,4,6,5,5,
6,4,6,3,6,2,6,1,6,,6,,5,,4,,3,,2
,,1
240 DATA 1,,2,,3,,4,,5,,6,,6,1,,
1,,2,,3,,4,,5,1,6,2,6,3,6,4,6,5,
6,6,6,6,5
250 DATA ,,1,,2,,3,,4,,5,,6,1,6,
2,6,3,6,4,6,5,5,6,4,6,3,6,2,6,1,
6,,6,,5,,4,,3,,2,,1
260 DATA ,,1,,2,,3,,4,,5,,6,,,1,
,2,,3,1,3,2,3,3,3,4,3,,4,,5,,6,1
,6,2,6,3,6,4,6,5,6,6,6
270 DATA ,,1,,2,,3,,4,,5,,6,,,1,
,2,,3,1,3,2,3,3,3,4,3,,4,,5,,6
280 DATA 1,,2,,3,,4,,5,,6,,6,1,,
1,,2,,3,,4,,5,1,6,2,6,3,6,4,6,5,
6,6,6,6,5,6,4,5,4
290 DATA ,,,1,,2,,3,,4,,5,,6,1,3
,2,3,3,3,4,3,5,3,6,,6,1,6,2,6,3,
6,4,6,5,6,6
300 DATA 2,,3,,4,,3,1,3,2,3,3,3,
4,3,5,3,6,2,6,4,6
310 DATA ,5,,6,1,6,2,6,3,6,4,6,5
,6,5,5,5,4,5,3,5,2,5,1,5,,4,,6,
320 DATA ,,,1,,2,,3,,4,,5,,6,1,3
,2,3,3,2,4,1,5,,3,4,4,5,5,6
330 DATA ,,,1,,2,,3,,4,,5,,6,1,6
,2,6,3,6,4,6,5,6,6,6
340 DATA ,,,1,,2,,3,,4,,5,,6,1,1
,2,2,3,3,4,2,5,1,6,,6,1,6,2,6,3,
6,4,6,5,6,6
350 DATA ,,,1,,2,,3,,4,,5,,6,1,,
2,1,3,2,4,3,5,4,6,,6,1,6,2,6,3,6
,4,6,5,6,6
360 DATA ,1,,2,,3,,4,,5,1,6,2,6,
3,6,4,6,5,6,1,,2,,3,,4,,5,,6,1,6
,2,6,3,6,4,6,5
370 DATA ,,,1,,2,,3,,4,,5,,6,1,,
2,,3,,4,,5,,6,1,6,2,5,3,4,3,3,3,
2,3,1,3
380 DATA ,1,,2,,3,,4,,5,1,,2,,3,
,4,,5,,6,1,6,2,6,3,6,4,4,4,5,5,6
,6,1,6,2,6,3,6,4,6
390 DATA ,,,1,,2,,3,,4,,5,,6,1,,
2,,3,,4,,5,,6,1,6,2,5,3,4,3,3,3,
2,3,1,3,3,4,4,5,5,6
400 DATA 6,1,6,,5,,4,,3,,2,,1,,,
1,,2,1,3,2,3,3,3,4,3,5,3,6,4,6,5
,5,6,4,6,3,6,2,6,1,6,,6,,5
410 DATA ,,1,,2,,3,,4,,5,,6,,3,1
,3,2,3,3,3,4,3,5,3,6
420 DATA ,,,1,,2,,3,,4,,5,1,6,2,
6,3,6,4,6,5,6,6,5,6,4,6,3,6,2,6,
1,6,
430 DATA ,,,1,,2,,3,1,4,2,5,3,6,
4,5,5,4,6,3,6,2,6,1,6,
440 DATA ,,,1,,2,,3,,4,,5,,6,1,5
,2,4,3,3,4,4,5,5,6,6,6,5,6,4,6,3
,6,2,6,1,6,
450 DATA ,,1,1,2,2,3,3,4,4,5,5,6
,6,,6,1,5,2,4,4,2,5,1,6,
460 DATA ,,,1,1,2,2,3,3,4,3,5,3,
6,4,3,5,2,6,1,6,
470 DATA ,,1,,2,,3,,4,,5,,5,1,4,
2,3,3,2,4,1,5,1,6,2,6,3,6,4,6,5,
6,6,6
480 FORZ=1TO38:READAA,BB:A(Z)=AA
:B(Z)=BB:DE=DE+AA+BB:NEXT
490 IF DE<>30021THENPRINT:PRINT"
DATA ERROR LINES 500-510!":STOP
500 DATA 1,27,28,29,30,45,46,55,
56,76,77,93,94,107,108,127,128,1
50,151,163,164,186,187,209,210,2
31,232,257,258,276,277,298,299,3
21,322,338,339,359,360,378,379,3
89
510 DATA 390,404,405,419,420,432
,433,451,452,470,471,490,491,509
,510,530,531,552,553,575,576,588
,589,605,606,618,619,637,638,650
,651,661,662,678
520 GOTO680
530 N=(LL-1)*128+1024:FORX=N TO
N+127:POKEX,128:NEXT:RETURN
540 L=(LL-1)*8:FORZB=1TO LEN(W$)
:Z$=MID$(W$,ZB,1)
550 IFZ$=CHR$(46)THENSET(PP,L+6,
C):PP=PP+2:NEXT:RETURN
560 IFZ$=CHR$(32)THENPP=PP+4:NEX
T:RETURN
570 IFZ$="!"THENSET(PP,L+6,C):SE
T(PP,L+4,C):SET(PP,L+3,C):SET(PP
,L+2,C):SET(PP,L+1,C):SET(PP,L,C
):PP=PP+2:NEXT:RETURN
580 GOSUB590:PP=PP+8:NEXT:RETURN
590 IFZ$="$"THENZ=ASC(Z$)-35
600 IFZ$="-"THENZ=ASC(Z$)-43
610 IFZ$>"/"ANDZ$<":"THENZ=ASC(Z
$)-45
620 IFZ$>"@"ANDZ$<CHR$(91)THENZ=
ASC(Z$)-52
630 FORI=A(Z) TO B(Z)
640 IFCC=9THENC=RND(8):GOTO660
650 C=CC
660 SET(PP+H(I),L+V(I),C):NEXT:R
ETURN
670 FORD=1TO2000:NEXT:RETURN
680 CLS0
690 PP=4:LL=1:CC=9:W$="RAINBOW":
```

```
GOSUB540
700 PP=2:LL=2:CC=1:W$="HAS MANY"
:GOSUB540
710 PP=0:LL=3:CC=2:W$="PROGRAMS"
:GOSUB540
720 PP=6:LL=4:CC=3:W$="FOR YOU."
:GOSUB540
730 GOSUB670
740 LL=2:GOSUB530
750 PP=12:LL=2:CC=4:W$="GAMES":G
OSUB540
760 LL=3:GOSUB530:LL=4:GOSUB530
770 PP=2:LL=3:CC=5:W$="ADVEN-":G
OSUB540
780 PP=18:LL=4:CC=5:W$="TURES":G
OSUB540
790 GOSUB670
800 FORLL=2TO4:GOSUB530:NEXT
810 PP=0:LL=2:CC=6:W$="SIMUL-":G
OSUB540
820 PP=12:LL=3:CC=6:W$="ATIONS":
GOSUB540
830 PP=0:LL=4:CC=7:W$="AND MORE.
":GOSUB540
840 GOSUB670
850 LL=2:GOSUB530
860 PP=2:LL=2:CC=8:W$="FOR ONLY"
:GOSUB540
870 LL=3:GOSUB530
880 PP=10:LL=3:CC=2:W$="$31.00":
GOSUB540
890 LL=4:GOSUB530
900 PP=0:LL=4:CC=7:W$="PER YEAR!
":GOSUB540
910 GOSUB670
920 LL=2:GOSUB530
930 PP=6:LL=2:CC=2:W$="ON TAPE":
GOSUB540
940 LL=3:GOSUB530
950 PP=10:LL=3:CC=2:W$="$80.00":
GOSUB540
960 GOSUB670
970 CLS0
980 PP=2:LL=1:C=8:W$="FOR SALE":
GOSUB540
990 PP=0:LL=2:CC=9:W$="COLOR T.V
.":GOSUB540
1000 PP=2:LL=3:CC=4:W$="BARGAIN!
":GOSUB540
1010 PP=6:LL=4:CC=5:W$="$126.75"
:GOSUB540
1020 GOSUB670
1030 GOTO680
```

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16K
ECB

Lighten the end-of-semester work load with this handy program that's sure to become . . .

The Teacher's Pet

By Ron Powers

The end of a grading period is always hectic. At such a time a computerized grade calculator can save a lot of headaches. A program like this can also be used at the midpoint of a grading period when parent-teacher conferences are often held.

I operate on a point system and keep raw scores in my gradebook. This way I can also keep track of scores for workbook lessons, homework, quizzes, tests and written and oral reports. That way I am not always having to calculate percentage grades. The percentage and letter grades are calculated by *The Grade Calculator.*

The Grade Calculator does not store data to either tape or disk files, but prints out the results for each student as they are entered.

When the program is run, you are asked to enter the class, such as English I-A. This will be printed on each student report. Next, you are asked to enter the number of scores to be averaged. This figure is used to dimension variables. Then you are asked to enter the perfect scores. The perfect scores, once entered, are kept in memory.

```
JIM                    MATH
GRADE #       SCORE                 PERFECT SCORE
 1             98                   100
 2             83                   100
 3             87                   100
 4             91                   100
TOTALS        359                   400
PERCENT GRADE =   89.75
LETTER GRADE = B
```

Sample Printout

Next, you are prompted to enter a student's name. At this point, the class name, student name and column headings are printed. Enter the student scores, and, as each is entered, the printer prints what number score that is, the student score and the corresponding perfect score. When all the scores are entered, a percentage grade is calculated and printed, followed by a letter grade.

Line 60 dimensions the student score variable, A(S), and the perfect score variable, B(S). Lines 70 to 90 allow entering perfect scores. Line 100 is for entering the student's name and printing the headings. Lines 120 to 170 create a `FOR/NEXT` loop for entering student scores; printing score #, perfect score and student score; and keeping running totals of both sets of scores. Line 190 calculates the percentage grade, and the subroutine beginning at Line 300 chooses the proper letter grade.

While *The Grade Calculator* is a very simple program, it does the job in much less time than figuring grades by hand or with a pocket calculator. Printing each individual score lets you double-check that all entries were properly made.

(You may direct your questions to the author at Rt. 1 Box 43, Davenport, ND 58021, 701-347-4321. Please enclose an SASE for a reply.) ☐

Ron Powers lives in Davenport, North Dakota and teaches high school English. Before reentering the teaching profession in 1985, he spent 20 years as a broadcast journalist. A CoCo owner for three years, Ron has only had a serious interest in programming for less than a year.

The listing: GRADCALC

120 131
END 71

```
1 GOTO 10
2 SAVE"GRADCALC":SAVE"GRACAL2",A
:END
3 '*****GRADCALC/BAS*****
4 '*****COPYRIGHT 1985*****
5 '*****RON POWERS*****
6 '*****DAVENPORT, ND 58021****
10 CLEAR 5000
20 CLS:PRINT"   SCORE TO PERCENT
 CALCULATOR"
30 PRINT:PRINT"MAKE SURE PRINTER
 IS TURNED ON  AND PAPER IS POSI
TIONED PROPERLY"
40 LINE INPUT "CLASS ==> ";G$
50 PRINT:INPUT "NUMBER OF SCORES
 TO BE AVERAGED";S
60 DIM A(S), B(S)
70 FORX=1TOS
80 INPUT "PERFECT SCORE ";B(X)
90 NEXT X
100 CLS:LINE INPUT "NAME ==> ";N
$:PRINT#-2,TAB(5)N$;TAB(25);G$
110 PRINT#-2,TAB(5)"GRADE #";TAB
(17)"SCORE";TAB(35)"PERFECT SCOR
E"
120 FORX=1TOS
130 INPUT "STUDENT SCORE ";A(X)
140 PRINT#-2,TAB(5)X;TAB(17)A(X)
;TAB(35)B(X)
150 G=A(X):G1=G+G1
160 H=B(X):H1=H+H1
170 NEXTX
180 PRINT#-2,TAB(5)"TOTALS";TAB(
17)G1;TAB(35)H1
190 R=G1/H1*100
200 PRINT#-2,TAB(5)"PERCENT GRAD
E = ";R
210 GOSUB300
220 PRINT#-2,TAB(5)"LETTER GRADE
 = ";L$
225 PRINT#-2,"":PRINT#-2,""
230 G=0:G1=0:H=0:H1=0:GOTO 100
300 IF R>=96 THEN L$="A":RETURN
310 IF R>=94 THEN L$="A-":RETURN
320 IF R>=92 THEN L$="B+":RETURN
330 IF R>=89 THEN L$="B":RETURN
340 IF R>=87 THEN L$="B-":RETURN
350 IF R>=85 THEN L$="C+":RETURN
360 IF R>=82 THEN L$="C":RETURN
370 IF R>=80 THEN L$="C-":RETURN
380 IF R>=78 THEN L$="D+":RETURN
390 IF R>=76 THEN L$="D":RETURN
400 IF R>=75 THEN L$="D-":RETURN
410 IF R<75 THEN L$="F":RETURN
```

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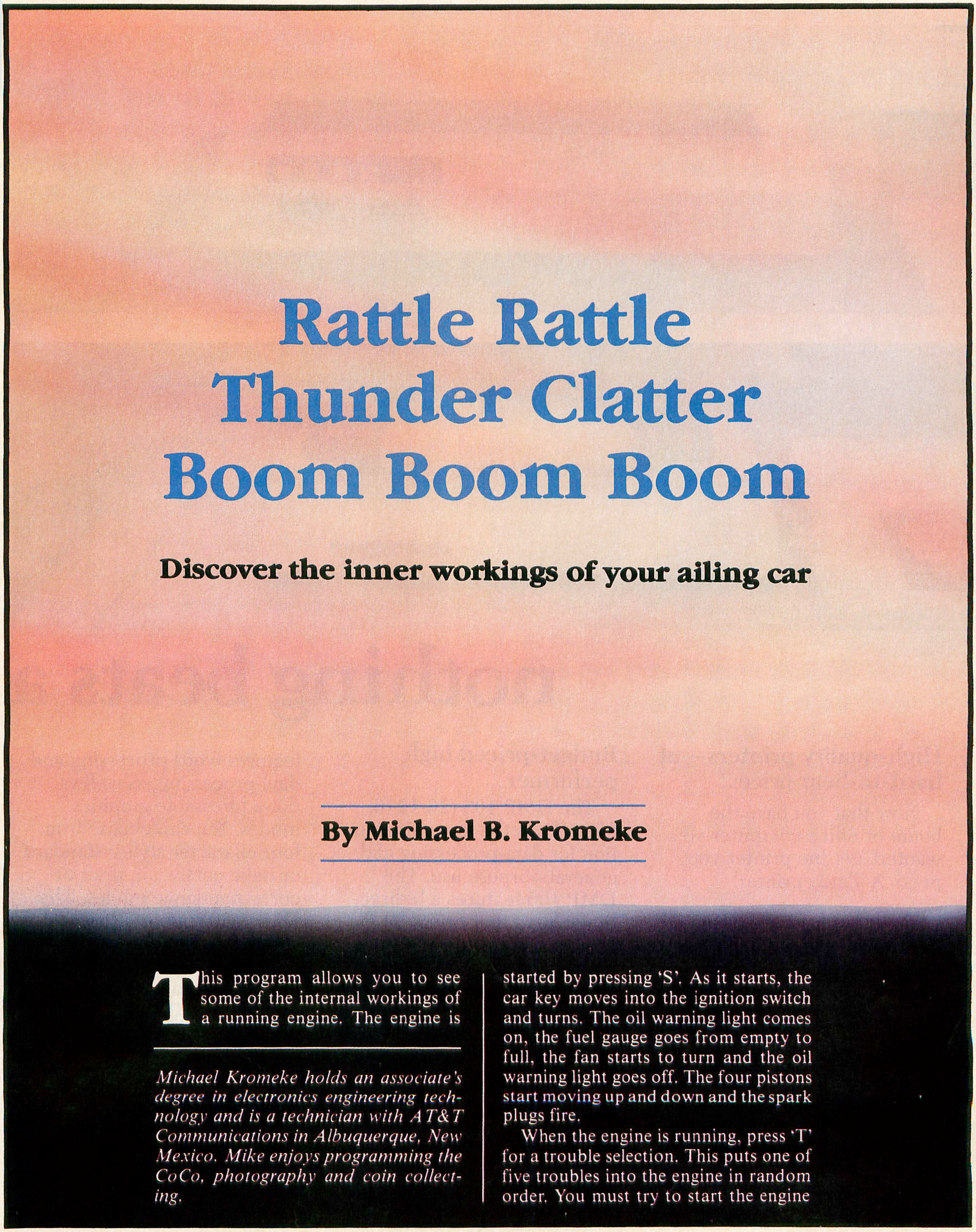
16K ECB

16K Mod.



Rattle Rattle Thunder Clatter Boom Boom Boom

Discover the inner workings of your ailing car

By Michael B. Kromeke

This program allows you to see some of the internal workings of a running engine. The engine is started by pressing 'S'. As it starts, the car key moves into the ignition switch and turns. The oil warning light comes on, the fuel gauge goes from empty to full, the fan starts to turn and the oil warning light goes off. The four pistons start moving up and down and the spark plugs fire.

When the engine is running, press 'T' for a trouble selection. This puts one of five troubles into the engine in random order. You must try to start the engine

---

Michael Kromeke holds an associate's degree in electronics engineering technology and is a technician with AT&T Communications in Albuquerque, New Mexico. Mike enjoys programming the CoCo, photography and coin collecting.

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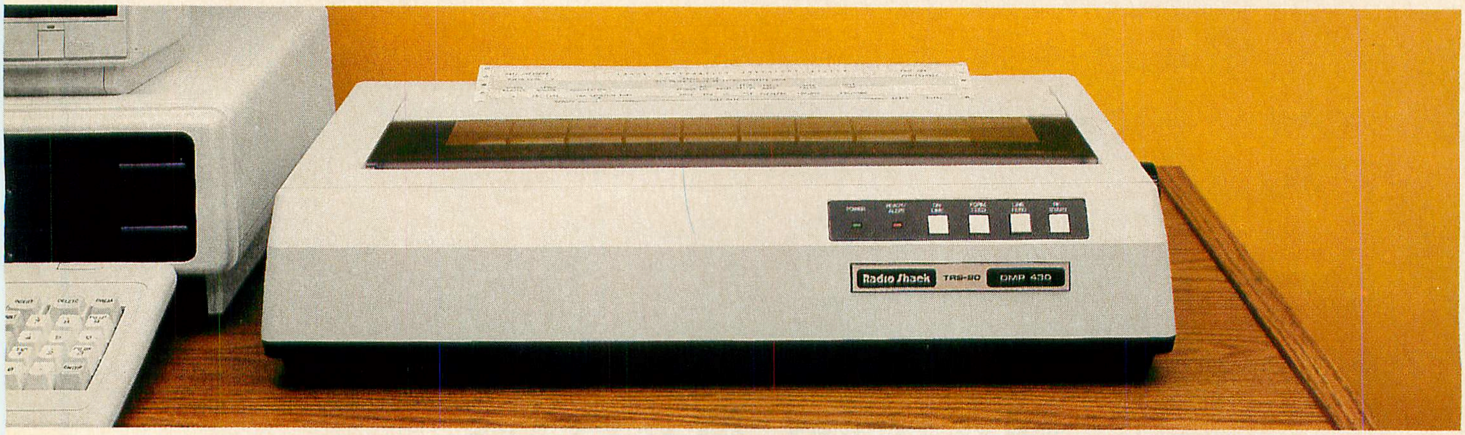

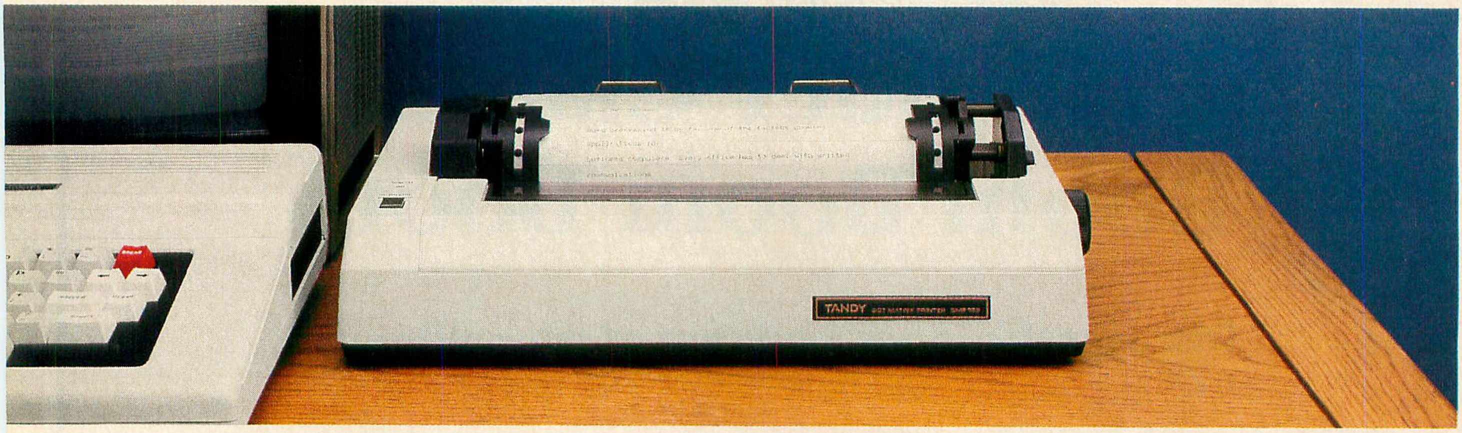

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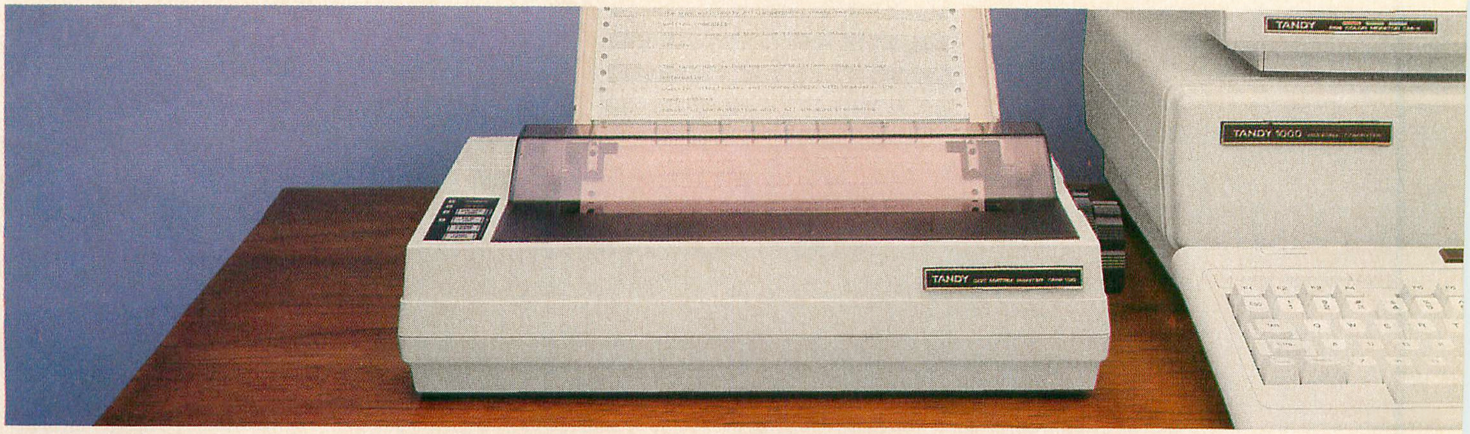
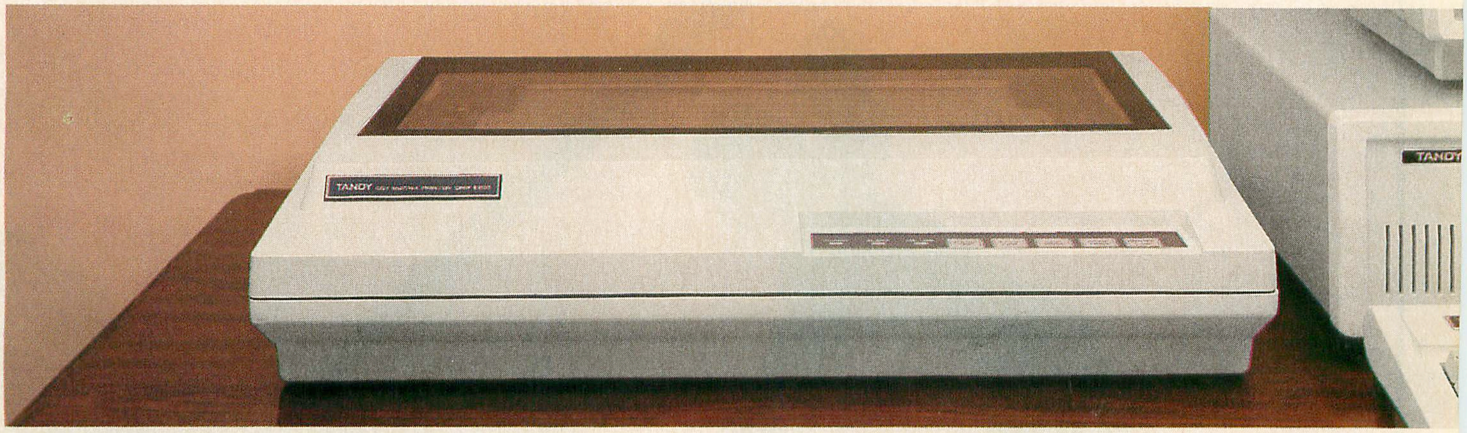
PC-compatible computer,





Tandy printer.

Low-cost business printer

The DMP 430 (26-1277, $699.00) is a dot-matrix printer with an 18-wire print head that delivers superior correspondence fonts in a single pass. Prints 10, 12, or 16.7 cpi, plus elongated, standard, elite and condensed. You can also get micro, italic and double-high fonts. Prints original, plus two copies at 180 characters per second. IBM PC compatible.

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Get high speed and high performance with our finest printer, the DMP 2200 (26-1279, $1695.00). Efficient, fast printing means no long and costly delays for reports. Supports elongated, double-high, bold, underline, super/subscripts, italics and double-strike modes, plus bit-image graphics. Prints up to 380 characters per second. Features a true pin-driven tractor—not sprocket. Prints original, plus up to six copies. Parallel interface only. IBM PC compatible.

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again. If it fails to start or does not run properly, you must go to the checklist by pressing 'C'.

The checklist gives 11 different possibilities. Choose one of the possibilities and information about that kind of trouble is displayed. You will be told whether you have correctly identified the problem or not.

If an incorrect answer is picked, you are sent back for another look at the trouble. A correct answer returns you to a properly running engine. After correctly finding all five troubles, your score and skill level are displayed. The three skill levels are beginner, shade tree mechanic and master mechanic.

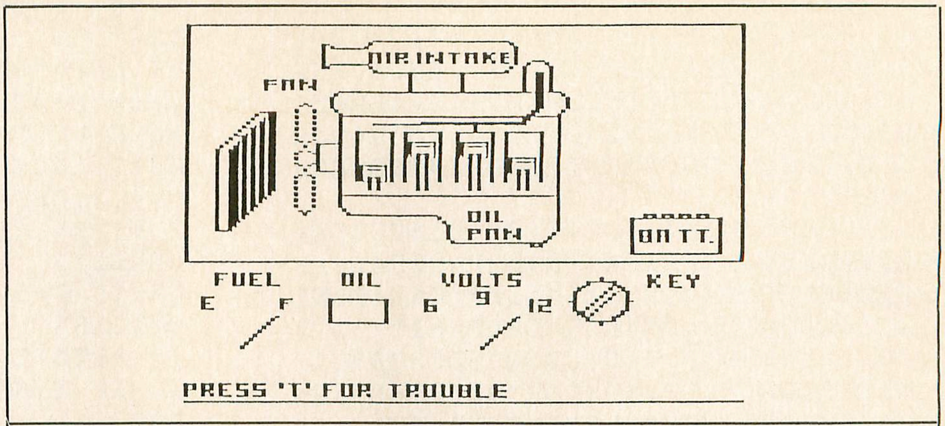
Anytime the engine is running, even improperly, you may stop and start it by pressing 'S'.

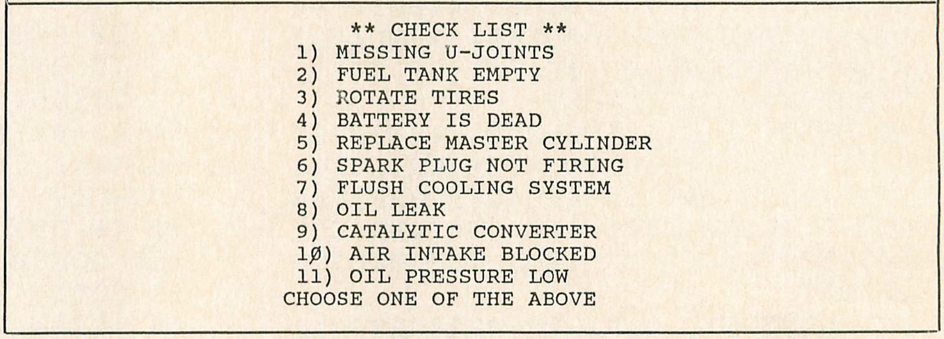
To run this program with only 16K, delete all REM statements. Deleting the following lines will not affect the program: 30, 34, 38, 42, 48, 70, 84, 88, 92, 96, 100, 106, 112, 120, 176, 180, 184, 188 and 216.

Variables

A = answer
B = miscellaneous counter
C1 = cylinder 1
C2 = cylinder 2
C3 = cylinder 3
C4 = cylinder 4
D = number of trouble
E = oil leak counter
F = vertical location of cylinder
G = picture of piston
H = picture of key in slot
I & M = trouble in engine
R = number of right answers
W = wrong answer counter
Y = horizontal location of cylinder
A$ = draw picture of fan not turning
Z$ = miscellaneous input

(Mr. Kromeke can be reached at 9940 Academy Knolls N.E., Albuquerque, NM 87111. Please enclose an SASE when writing.) ☐





```
** CHECK LIST **
 1) MISSING U-JOINTS
 2) FUEL TANK EMPTY
 3) ROTATE TIRES
 4) BATTERY IS DEAD
 5) REPLACE MASTER CYLINDER
 6) SPARK PLUG NOT FIRING
 7) FLUSH COOLING SYSTEM
 8) OIL LEAK
 9) CATALYTIC CONVERTER
 10) AIR INTAKE BLOCKED
 11) OIL PRESSURE LOW
CHOOSE ONE OF THE ABOVE
```

24	140	148	99
54	180	160	249
64	165	174	237
90	201	196	12
114	30	END	111
136	68		

The listing: ENGINE

```
2 CLEAR200:DIM A,B,C1,C2,C3,C4,D
,E,F,G(7),H(18),I,M,R:C1=12:C2=3
:C3=9:C4=6:B=RND(-TIMER)
4 GOSUB196:GOTO50
6 ON F GOSUB36,40,44,40,36,32,36
,40,44,40,36,32:RETURN
8 SCREEN1:Y=0:F=C1:GOSUB6:C1=C1+
1:IF C1=13 THEN DRAW"BM86,51C4ND
2":PLAY"T255A":GOSUB28:DRAW"C1ND
2":C1=1
10 Y=23:F=C2:GOSUB6:C2=C2+1:IFC2
=13 AND D<>3THEN DRAW"BM109,51C4
ND2":PLAY"A":GOSUB28:DRAW"C1ND2"
:C2=1
12 IF C2=13 THEN C2=1
14 Y=46:F=C3:GOSUB6:C3=C3+1:IFC3
=13 THEN DRAW"BM132,51C4ND2":PLA
Y"A":GOSUB28:DRAW"C1ND2":C3=1
16 IF D=4 THEN PSET(126+RND(44),
112+RND(7),2):E=E+1:IF E>100 THE
N:PAINT(80,144),4,3:SOUND2,20:GO
TO220
18 Y=69:F=C4:GOSUB6:C4=C4+1:IFC4
=13 THEN DRAW"BM155,51C4ND2":PLA
Y"A":GOSUB28:DRAW"C1ND2":C4=1
20 Z$=INKEY$:IFZ$=""THEN8
22 IF Z$="T"AND D=0THEN I=I+1:D=
M(I):GOTO50
24 IF Z$="C"AND D<>0 THEN122
26 IF Z$="S"THEN116 ELSE8
28 FORB=1TO100:NEXTB:RETURN
30 'CYLINDER MOVEMENT POSITION 1
32 PUT(80+Y,55)-(92+Y,71),G,PSET
:RETURN
34 'POSITION 2
36 PUT(80+Y,59)-(92+Y,75),G,PSET
:RETURN
38 'POSITION 3
40 PUT(80+Y,63)-(92+Y,79),G,PSET
:RETURN
42 'POSITION 4
44 PUT(80+Y,67)-(92+Y,83),G,PSET
:RETURN
46 PRINT@488,"PRESS <RETURN>";:L
INEINPUTZ$:RETURN
48 'MAIN SCREEN
50 PMODE3,1:PCLS:SCREEN1,0:DRAW"
BM0,0C2R255D120L255U120BM70,46C4
R100D40L100U40H4U4E4R100F4D4G4L4
4BU12U10R20E4U8H4L60G4L16H2L2D12
R2E2R16F4R16NR22D10BM0,191R255"
52 A$="BM60,68C3H10U14E4F4D14G8D
4F4NE4G4D14F4E4U14H4":DRAW"BM70,
86C4D6F4R40F6D6F2R42L2D2L3U2R5E6
U18BM70,60L10D14NR10":DRAW"XA$;B
M154,34RU12E4R4F4D12BM130,94NR4D
5R4U5BR4D5BR4NU5R3BL14BD4ND5R4D2
```

```
NL4BR4NR4D3U5R4D5BR4U5F5U5"
54 DRAW"BM36,28C2NR4D2NR4D3BR8U5
R4D2NL4D3BR4U5RF5U5BM84,19C4U3NR
4U2R4D5BR4U5BR4ND5R4D2L4UF4BR6U5
BR4ND5RF5U5BR4R2ND5R2BR4ND5R4D2N
L4D3BR4U3R2NF3NE2L2U2BR8NR3D2NR2
D3R3"
56 DRAW"BM204,98C4R40D18L40U18R6
U2R4D2R4U2R4D2R4U2R4D2R4U2R4D2L3
0BD6ND6C3R4D3NL4D3NL3BR4U6R4D3NL
4D3BR8U6L2R4BR4R4L2D6BR4R1"
58 DRAW"BM78,79C4U25R16D25BR7U25
R16D25BR7U25R16D25BR7U25R16D25BM
86,50C3R68E8U18L2D18G7L44BM14,64
C3E8NR6E4NR6E8R6G20L6D40R6NU40E2
0U39":POKE178,207:PAINT(34,55),,
3:POKE178,3:GOSUB86
60 DRAW"BM14,126C3NR4D3NR2D3BR8N
U6R4U6BR4NR4D3NR2D3R4BR4NR4U6BR3
4D6R4U6NL4BR4D6BR4NU6R4BR32H2U4B
R5D4G2BR6NR4U6R4D6BR4NU6R4BR4U6N
L2R2BR4NR4D3R4D3L4BM8,138NR4D3NR
2D3R4"
62 DRAW"BR32U3NR2U2R4BR18NR26D12
R26U12BR18NR4D6R4U3L4U3BR24BU4NR
4D3R4NU3D3NL3BR20BD4U6BR4R4D3L4D
3R4BM26,164C2H16BM214,54C4ND8R12
D2NL12D6L12R5D4BR3U6L3D2":GET(21
4,50)-(226,66),G,G:LINE(214,50)-
(226,66),PRESET,BF
64 DRAW"BM136,164C2":IF D=2 THEN
DRAW"H16"ELSEDRAW"E16"
66 CIRCLE(220,58),14,3,.9:DRAW"B
M212,64C3NE14F3E14":PAINT(220,58
),4,3:GET(206,46)-(234,70),H,G:L
INE(206,46)-(234,70),PRESET,BF:G
OSUB102
68 IF D=5 THEN PAINT(64,20),2,4:
GOTO182
70 'START ENGINE
72 IF INKEY$<>"S"THEN72 ELSEGOSU
B90
74 IF D=1 THEN186
76 IF D=2 THEN178
78 GOSUB94:FORB=0TO52STEP3:LINE(
50,42+B)-(58,42+B),PRESET:PLAY"T
140O1AF":NEXTB:PAINT(80,144),1,3
:GOSUB98
80 IF D=3 OR D=4 THEN GOSUB108 E
LSE GOSUB114
82 GOTO8
84 'DRAW KEY,CIRCLE & WORD KEY
86 CIRCLE(190,140),14,3,.9:DRAW"
BM188,150C3U20R4D20BR20NH4E4F4E4
R6F6R6E6U4H6L6G6L22ND4BR29BD2ER2
F2G2L2H2BL24BU12C2U6D3R2NE3F3BR6
```

Two-Liner Contest Winner . . .

For this game, use the right joystick to move the target up and down and catch the arrows. Don't let them get by you, though.

The listing:

```
1 CLS0:A$=CHR$(191):B$=CHR$(127)
:C$=CHR$(128):Q=2:Y=13/63:C=32:C
A=3:PRINT@9,"ARROW CATCH";:PRINT
@34,"ARROWS:","CATCHERS:";:FORZ=
1TO9:Z=1:R=RND(14)*32+64:FORX=Q
TO30:J=JOYSTK(0):J=(INT(JOYSTK(1
)*Y)*C+64):IF L<>J THENPRINT@L,C
$;:PRINT@J,A$;:L=J
2 PLAY"T255O3A":PRINT@R-X,C$;:PR
INT@R-X-1,B$;:NEXTX:CA=(INT(AR/5
0)+3-SU):Q=2+INT(AR/10):PRINT@57
,CA;:PRINT@R-X,C$;:IFR-X=J+1THEN
SOUND100,1:AR=AR+1:PRINT@42,AR;:
NEXTELSESU=SU+1:CA=CA-1:PRINT@57
,CA;:IFCA=0THENPRINT,"BY KEVIN D
ERBY"ELSENEXT
```

Kevin Derby
Lubbock, TX

(For this winning two-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape.*)

Two-Liner Contest Winner . . .

Nitstrik is a neat little shoot-em-up. Center the enemy's chopper in your sights using the joystick and fire when ready. Caution: It isn't as easy as it sounds!

The listing:

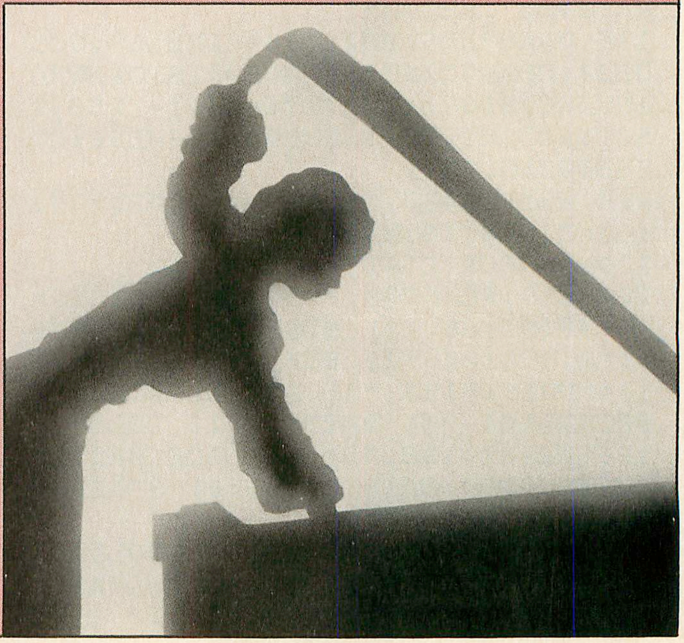
```
1 PMODE4:SCREEN1,1:PCLS:O=128:P=
96:C$="U1NL8NR8D1L1G1D1F1NG2R2NF
2E1U1H1NL1G1NR2NL2H1":FORJ=1TO10
00:PCLS:X=JOYSTK(0)*4:Y=JOYSTK(1
)*3:CIRCLE(X,Y),8:H=RND(10):V=RN
D(10):O=O+H-5:P=P+V-5:DRAW"S8BM"
+STR$(O)+","+STR$(P)+C$
2 Q=PEEK(65280):IFQ=127 ORQ=255
ORX+3<O ORX-3>O ORY+3<P ORY-3>P
THENNEXT:ELSEPOKE359,126:CLS:PRI
NT"NIGHT-STRIKE REPORT:","ENEMY
KILLED IN"J"MOVES","AGAIN (Y/N)"
;:INPUT D$:IFD$<>"Y"THENPRINT"MI
SSION TERMINATED":END:ELSE RUN
```

Ric Small
Searcy, AR

(For this winning two-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape.*)

```
NR4U3NR2U3R4BR4D2R4NU2L2D4":PAIN
T(216,144),2,3:RETURN
88 'KEY TO START POSITION
90 LINE(208,135)-(248,153),PRESE
T,BF:PLAY"T80ABCDEF":PUT(176,128
)-(204,152),H,PSET:RETURN
92 'FUEL GAGE FROM E TO F
94 PAINT(80,144),4,3:GOSUB28:DRA
W"BM26,164C1NH16":GOSUB28:DRAW"C
2NU16":GOSUB28:DRAW"C1NU16":GOSU
B28:DRAW"C2E16":GOSUB28:RETURN
96 'BLANK BOX
98 LINE(44,176)-(255,190),PRESET
,BF:RETURN
100 'DRAW PRESS S FOR START
102 DRAW"BM0,182C3ND6R4D3L4D3BR8
U6R4D3L4R2F3BR4NR4U3NR2U3R4BR4NR
4D3R4D3NL4BR4R4U3L4U3R4BR8ND2BR4
NR4D3R4D3NL4BR4BU4U2BR8R2NR2D6BR
6NR4U6R4D6BR9BU6NR4D3R4D3NL4BR6U
6L2R4BR4ND6R4D3NL4D3BR4U6R4D3L4R
2F3BR6U6L2R4"
104 DRAW"BR8NR4D6R4U6BR4ND6R4D3L
4RF3BR10BU6NR4D3R4D3NL4BR6U6L2R4
BR4NR4D6R4U6BR4ND6R4D3L4":RETURN
106 'DRAW C FOR CHECK LIST
108 DRAW"BM45,182C3ND2BR4NR4D6R4
BR4BU4U2BR7NR4D3NR3D3BR8NR4U6R4D
6BR4U6R4D3L4R2F3BR10NR4U6R4BR4D3
NR4D3BR4U6BR4NR4D3NR2D3R4BR4NR4U
6R4BR4D3R2NE3NF3L2D3"
110 DRAW"BR16NU6R4BR4U6BR4NR4D3R
4D3NL4BR6U6NL2R2":RETURN
112 'DRAW T FOR TROUBLE
114 DRAW"BM45,182C3ND2BR4R2NR2D6
BR6BU4U2BR7NR4D3NR2D3BR8NR4U6R4D
6BR4U6R4D3L4R2F3BR12U6NL2R2BR4ND
6R4D3L4RF3BR4NR4U6R4D6BR4NU6R4U6
BR4D6R4U3NL4U3NL4BR4D6R4BR4NR4U3
NR3U3R4":RETURN
116 DRAW"XA$;BM26,164C1NE16":GOS
UB28:DRAW"C2NU16":GOSUB28:DRAW"C
1NU16C2H16":LINE(176,126)-(250,1
52),PRESET,BF:GOSUB98:GOSUB86:GO
SUB102:GOTO72
118 PRINT@487,"PRESS <RETURN> ";
:LINEINPUTZ$:RETURN
120 'CHECK LIST
122 CLS:PRINT@8,"** CHECK LIST *
*":PRINT@68,"1) MISSING U-JOINTS
":PRINT@100,"2) FUEL TANK EMPTY"
124 PRINT@132,"3) ROTATE TIRES":
PRINT@164,"4) BATTERY IS DEAD"
126 PRINT@196,"5) REPLACE MASTER
 CYLINDER":PRINT@228,"6) SPARK P
LUG NOT FIRING"
128 PRINT@260,"7) FLUSH COOLING
SYSTEM":PRINT@292,"8) OIL LEAK"
130 PRINT@324,"9) CATALYTIC CONV
ERTER":PRINT@355,"10) AIR INTAKE
 BLOCKED"
132 PRINT@387,"11) OIL PRESSURE
LOW"
134 PRINT@450,"CHOOSE ONE OF THE
 ABOVE";:INPUTZ$:A=VAL(Z$)
136 IF A<1 OR A>11 THEN SOUND1,1
:GOTO134
138 ON A GOTO140,142,146,150,154
,156,160,164,168,172,174
140 CLS:PRINT@4,"** MISSING U-JO
INTS **":PRINT@65,"THE U-JOINTS
CONNECT THE DRIVE- SHAFT TO THE
DIFFERENTIAL WHICH TURN THE WHEE
LS. THE U-JOINTS   ARE NOT IN TH
IS PROGRAM .":GOTO190
142 CLS:PRINT@6,"** FUEL TANK EM
PTY **":PRINT@65,"LOCATED ON THE
 LEFT SIDE OF THE SCREEN, THE E
STANDS FOR EMPTY  AND F STANDS F
OR FULL. GASOLINE IS MADE FROM P
ETROLEUM THAT IS  A NATURAL FLAM
MABLE LIQUID"
144 PRINT" HYDROCARBON MIXTURE T
HAT COST   AN ARM AND A LEG.":GO
TO190
146 CLS:PRINT@6,"** ROTATE TIRES
 **":PRINT@65,"YOU CAN INCREASE
THE LIFE OF    YOUR TIRES BY ROT
ATING THEM     ONCE EVERY 5000 M
ILES OR SO.    CARS WITH FRONT-W
HEEL DRIVE     SHOULD NOT BE ROT
ATED. TO GET   MAXIMUM TIRE LIFE
 YOU SHOULD"
148 PRINT" CHECK AIR PRESSURE EV
ERY 30     DAYS WHEN TIRES ARE C
OLD FOR    MANUFACTURER RECOMMEN
DED PRES-  SURE.":GOTO190:GOSUB
118
150 CLS:PRINT@6,"** BATTERY IS D
EAD **":PRINT@65,"THIS CAR IS RU
NNING ON A 12    VOLT SYSTEM. C
HECKING THE      VOLTAGE READIN
G ON THE INSTRU- MENT PANEL WE
CAN SEE IF WE    HAVE THE PROPE
R READING. ANY-  THING ABOVE 9.
6 VOLTS AFTER 15"
152 PRINT" SECONDS OF CRANKING T
HE ENGINE  SHOULD BE ADEQUATE.":
GOTO190
154 CLS:PRINT@2,"** REPLACE MATE
R CYLINDER **":PRINT@65,"THE MAS
TER CYLINDER IS NOT      SHOWN I
N THIS DIAGRAM. IT IS A  VERY IM
PORTANT PART OF THE      BRAKE S
YSTEM.":GOTO190
156 CLS:PRINT@2,"** SPARK PLUG N
OT FIRING **":PRINT@65,"THE IGNI
TION SYSTEM IS DESIGNED TO IGNIT
```

```
E THE AIR/FUEL MIXTURE  THAT IS
DRAWN INTO THE ENGINE   THROUGH
THE CARBURETOR. IF THE  SPARK PL
UGS FAIL TO FIRE THEN"
158 PRINT" YOUR ENGINE WILL NOT
RUN PROP-  ERLY.":GOTO190
160 CLS:PRINT@2,"** FLUSH COOLIN
G SYSTEM **":PRINT@65,"THE COOLI
NG SYSTEM SHOULD BE     DRAINED A
ND FLUSHED EVERY TWO    YEARS, AN
D NEW COOLANT ADDED.    THE RADIA
TOR IS SHOWN IN THIS    DIAGRAM A
ND HELPS KEEP THE"
162 PRINT" ENGINE FROM OVER HEAT
ING BUT    DOES NOT EFFECT ITS R
UNNING.":GOTO190
164 CLS:PRINT@9,"** OIL LEAK **"
:PRINT@65,"KEEP YOUR EYES ON THE
 OIL PAN . IF IT STARTS TO LEAK
WE WILL    SEE THE OIL WARNING L
IGHT COME"
166 PRINT" ON JUST BEFORE THE EN
GINE       FREEZES UP,DO TO LACK
 OF"," LUBRICANT.":GOTO190
168 CLS:PRINT@3,"** CATALYTIC CO
NVERTER **":PRINT@65,"THIS UNIT
CONVERTS HYDROCAR-     BONS AND C
ARBON MONOXIDE INTO    CARBON DIO
XIDE AND WATER VAPOR. EXPECTED S
ERVICE LIFE IS ABOUT"
170 PRINT" 50,000 MILES AND IS N
OT IN THIS PROGRAM.":GOTO190
172 CLS:PRINT@3,"** AIR INTAKE B
LOCKED **":PRINT@65,"THE AIR CLE
ANER HAS A DISPOS-     ABLE FILTER
 ELEMENT THAT SHOULD BE CHANGED
WHEN IT BECOMES        BLOCKED WIT
H DIRT. IF AIR CAN     NOT GET TO
THE CARBURETOR WE      WILL FAIL T
O GET IGNITION.":GOTO190
174 CLS:PRINT@4,"** OIL PRESSURE
 LOW **":PRINT@65,"THE RED WARNI
NG LIGHT WILL COME ON WHEN OIL P
RESSURE IS LOW.    THIS LIGHT WI
LL COME ON MOMEN-  TARILY WHEN S
TARTING ENGINE.":GOTO190
176 'BATTERY DEAD
178 GOSUB98:GOSUB108:IF INKEY$="
C"THEN122ELSE178
180 'AIR INTAKE BLOCKED
182 IF INKEY$<>"S"THEN182 ELSEGO
SUB90:GOSUB94:PAINT(80,144),1,3
184 'NO GAS
186 GOSUB98:GOSUB108:FORY=1TO3:P
LAY"T30ABCDEEDCBA":GOSUB28:NEXTY
:IF INKEY$="C"THEN122 ELSE186
188 'CORRECT ANSWER OR NOT
190 IF A=D*2 THENPRINT@422,"* CO
RRECT ANSWER *":R=R+1:D=0:SOUND1
40,11:SOUND180,11:SOUND176,4:SOU
ND165,4:SOUND154,4:SOUND200,12:S
OUND180,17:GOSUB46:IF R=5 THEN20
8 ELSE50
192 PRINT@425,"WRONG ANSWER":SOU
ND1,4:W=W+1:GOSUB46
194 SCREEN1,0:ON D GOTO186,178,8
,8,186
196 CLS0:PRINTSTRING$(160,191);S
TRING$(160,207);STRING$(160,175)
;:PRINT@71,"4 CYLINDER ENGINE";:
PRINT@230,"EDUCATIONAL PROGRAM";
:PRINT@391,"MICHAEL B KROMEKE";
198 A=A+1
200 M=RND(5):FORB=1TO5
202 IF M=M(B)THEN200
204 NEXTB:M(A)=M:IF A<5 THEN198
206 GOSUB218:RETURN
208 D=5/(5+W):CLS:PRINT@72,"NUMB
ER CORRECT 5":PRINT@136,"NUMBER
WRONG"W:PRINT@200,"SCORE ="INT(1
00*D)"%":GOSUB218:IF D<.5 THEN P
RINT@264,"BEGINNER"
210 IF D>.49 AND D<1 THENPRINT@2
62,"SHADE TREE MECHANIC"
212 IF D=1 THENPRINT@264,"MASTER
 MECHANIC"
214 GOSUB218:PRINT@328,"PLAY AGA
IN Y/N";:INPUTZ$:IFZ$="N"THEN EN
D ELSE RUN
216 'JOPLIN'S ENTERTAINER
218 PLAY"V30T2O2L8DD+EL4O3CO2L8E
O3L4CO2L8EO3CL2CL8CCDD+ECDEEO2BO
3DL2.CL4":RETURN
220 CLS4:PRINT@192," OIL LEAKED
OUT OF ENGINE AND IT FROZE UP. Y
OU LOST YOUR ENGINE  AND THE GAM
E. SORRY !!!"
```



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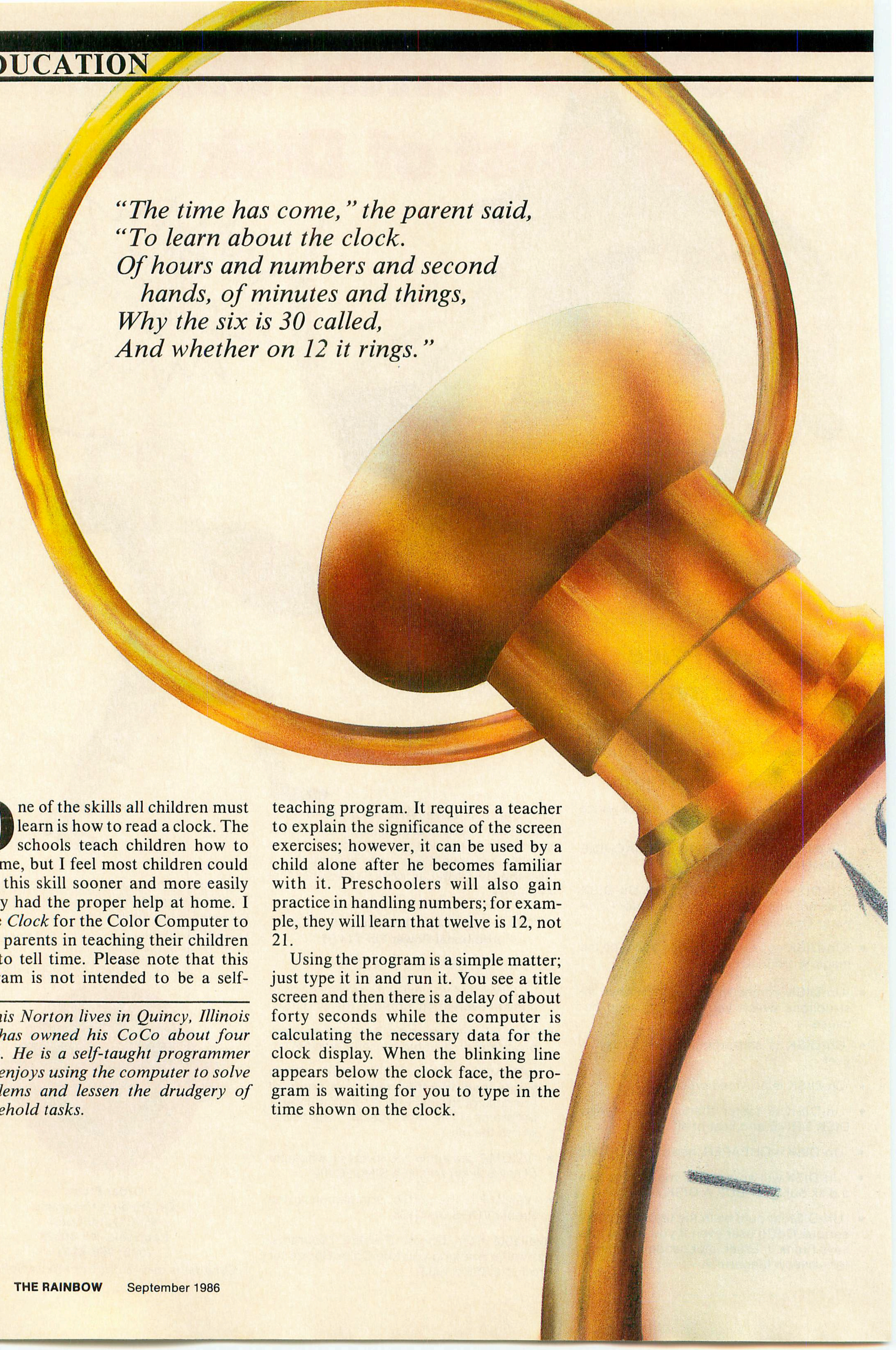


"The time has come," the parent said,
"To learn about the clock.
Of hours and numbers and second
hands, of minutes and things,
Why the six is 30 called,
And whether on 12 it rings."

One of the skills all children must learn is how to read a clock. The schools teach children how to tell time, but I feel most children could learn this skill sooner and more easily if they had the proper help at home. I wrote *Clock* for the Color Computer to assist parents in teaching their children how to tell time. Please note that this program is not intended to be a self-teaching program. It requires a teacher to explain the significance of the screen exercises; however, it can be used by a child alone after he becomes familiar with it. Preschoolers will also gain practice in handling numbers; for example, they will learn that twelve is 12, not 21.

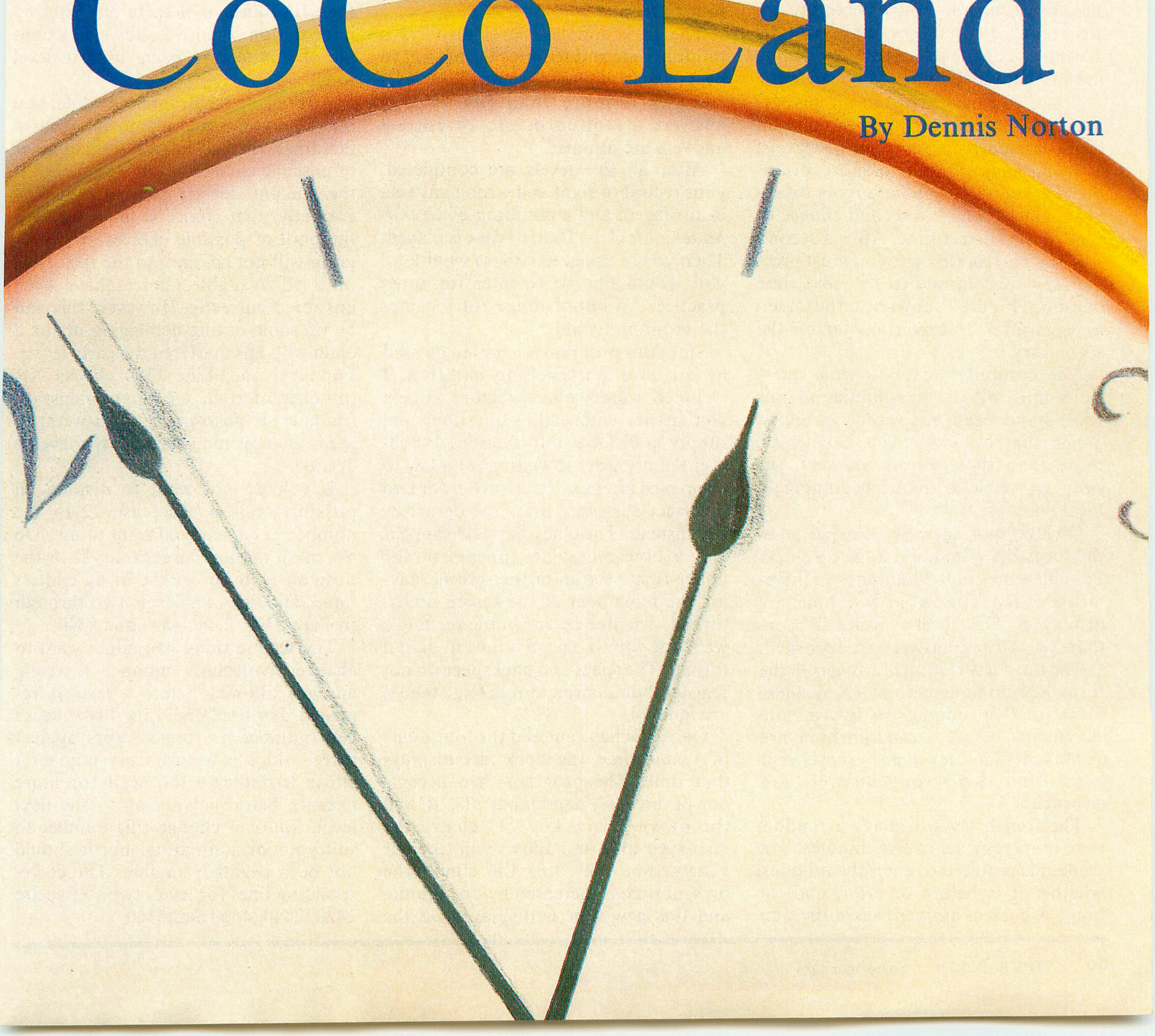
Using the program is a simple matter; just type it in and run it. You see a title screen and then there is a delay of about forty seconds while the computer is calculating the necessary data for the clock display. When the blinking line appears below the clock face, the program is waiting for you to type in the time shown on the clock.

Dennis Norton lives in Quincy, Illinois and has owned his CoCo about four years. He is a self-taught programmer who enjoys using the computer to solve problems and lessen the drudgery of household tasks.

32K
ECB

Chronologist in CoCo Land

By Dennis Norton



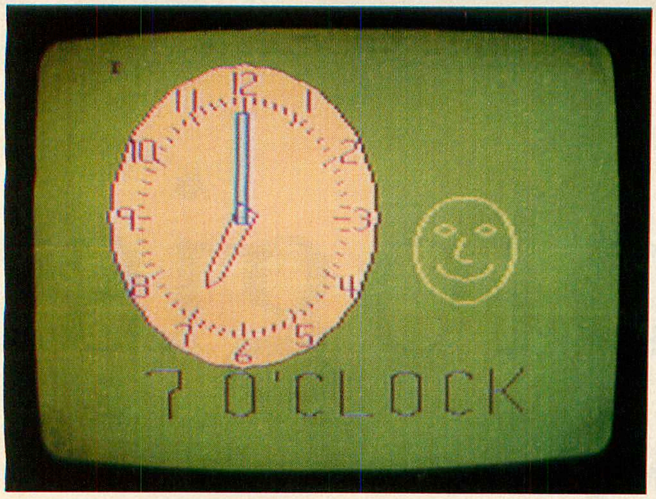


Figure 1. Level one screen display after giving correct answer on second try.

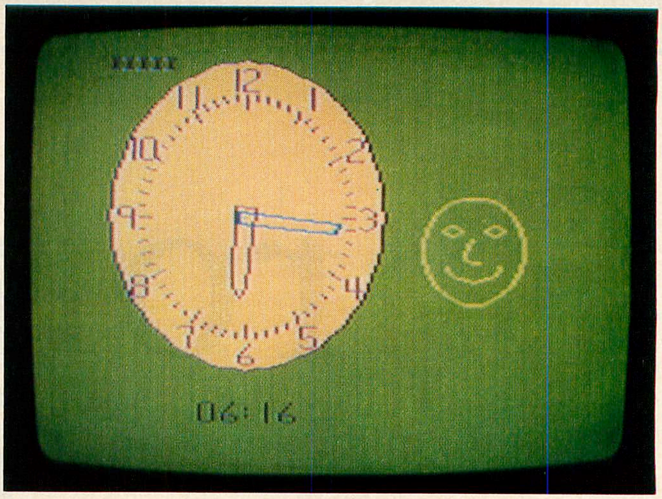


Figure 2. Level four screen display with user-control feature.

The program has five levels which introduce different formats and degrees of difficulty. In the first level all times shown are on the hour. There are restrictions on what key input will be accepted, but the left-arrow key can be used to backspace and change answers.

When you have typed in an answer, press ENTER and the computer tells you if you are correct. As in all the levels, a wrong answer causes a short, disapproving sound, then your answer disappears and you have a second chance to type in the correct time. After a second try, or a correct first try, you must press any key to continue to the next time question. Figure 1 shows how the screen appears after a correct answer on the second try.

The computer displays time questions until all the possibilities at this level have been answered correctly. When that occurs, if you have given more than three wrong answers, the program recycles to the beginning of level one.

On level two, answers are expected in the form XX minutes after XX o'clock. Possible times of 0-30 minutes in increments of five after a random hour are displayed. This level recycles if more than two wrong answers are recorded.

The third level requires answers in the form XX minutes before XX o'clock. Times of 0-30 minutes in five minute increments before a random hour are displayed. This level also recycles if more than two wrong answers are recorded.

The fourth level displays a random time in increments of five minutes. The student is required to enter the minutes, whether it is before or after, and the hour. A correct answer causes the time to be displayed in digital format in addition to the normal display. More than two wrong answers causes level four to recycle.

The fifth and last level displays a random time and requires the answer to be given in digital format. This level recycles if more than four wrong answers are given before 24 correct answers are attained.

After all five levels are completed, your record of right and wrong answers is displayed, and a rendition of *Grandfather's Clock* by Henry Work is played. Then you're asked to choose what level you would like to re-enter for more practice. An out-of-range entry causes the program to end.

Since this program is a tool to be used by an adult in teaching children, I included a user-control feature to help you answer your child's questions and supply additional information. Whenever the program is waiting for a key to be pressed after a correct answer (or two incorrect answers), press the up-arrow key instead. The clock hands disappear and a blue rectangle appears in the upper-right section of the screen, leaving the remainder of the screen undisturbed. The line cursor in the rectangle waits for you to type in a time in digital format. The space and backspace do not register, but incorrect times (e.g., 09:63) are ignored.

Once you have entered the four digits of a valid time, the clock face displays that time. The program then accepts one of three key commands: 'T', 'R' and the down-arrow key. 'T' clears the displayed time and allows you to enter a new time. 'R' runs the clock; the present time is increased by one minute and this new time is displayed on the screen. The clock continues to run until the 'S' key is pressed. The down-arrow key returns to the main program which then continues as if there has been no interruption. Figure 2 shows an example of this feature being used in level four.

After using the program a while, you may find you would like to change two factors. Each level has a certain number of possible choices of time to display. If the student doesn't answer a display correctly, that choice is put back into the pool of possible choices. The program will not advance to the next level until all available choices have been answered correctly. However, this can be tiresome during debugging or for a child who has mastered the early levels. For level one, Line 1390 checks NR (number of right answers) against 12 (number of possible right answers) to see if another loop through the level is desired.

If you do not want to display all possible choices, decrease 12 to the number of choices you want to use. Do not use a number larger than 12 or the program will be caught in an endless loop. The lines for levels two through five are 2390, 2390, 4590 and 5340.

The second thing you might want to change involves the number of wrong answers allowed before a level is repeated. For level one, Line 1410 checks NW (number of wrong answers) against three, which is an arbitrary number I chose to indicate the need for more practice before advancing to the next level. You can change this number to suit your own situation, but it should not be a negative number. The corresponding lines for levels two to five are 2420, 2440, 4610 and 5360.

If you are considering typing in the program, you may be discouraged by its length, but it is not necessary to type the entire program to use part of it. If you aren't sure the program is worth the effort, type in all lines up to 1420 and you will have level one. Additional levels can by typed as your fingers recover. The user-control feature will not operate at any level unless you have also typed lines 8000 to 8390.

As a bonus for typing the program you will acquire an adaptable clock face routine. The routine is based on the coordinates of the center of the circle (XX,YY) and the radius of the circle (R). By changing these three variables found in Line 106, you control the size and position of the clock on the screen. The only exception is that the size of the numbers on the face will not change. To draw the hands on the clock, set Z equal to the minutes (0-60) and HH equal to the hour (1-12) and `GOSUB 50`. For example, if you want to display a time of 10:23, let Z=23 and HH=10. To erase the hands use a line similar to Line 1380, first setting the draw color to the clock face color. The lines needed by the routine are 100 to 106, 150 to 174 and 300 to 620 to set up the data and display, and the subroutine 50 to 68 to draw the clock hands.

I'm sure parents have used many different methods to teach their children how to tell time, but this program can help if you are willing to invest time and knowledge. I hope you find *Clock* adds a little fun and encouragement to your child's learning experience.

(Questions about this program may be directed to Mr. Norton at 425 Carol Drive, Quincy, IL 62301. Please enclose an SASE for a reply.) ☐

				4320	125
28	167	1020	224	4500	18
57	203	1220	207	4620	39
74	251	2000	250	5190	211
150	178	2160	245	5340	80
180	106	2330	51	8070	186
380	154	4040	229	8250	200
500	106	4210	16	END	163

The listing: `CLOCK`

```
2 'COPYRIGHT (C) 1986 BY DENNIS
 NORTON
4 ' "CLOCK" 1.12  32K ECB
6 ' ORIGINAL BY D.N.; AID TO TEA
CHING CHILD HOW TO TELL TIME
10 CLEAR2000:PCLEAR4:PMODE3,1:Z=
RND(-TIMER):CLS5
11 PRINT@109,"clock";:PRINT@194,
" (C) 1986 BY DENNIS NORTON ";:P
RINT@290,"MUSIC:GRANDFATHER'S CL
OCK";:PRINT@332,"BY HENRY C. WOR
K";:PRINT@457," PLEASE WAIT. ";:
GOTO100
14 IFPPOINT(24,191)<>3 THENDRAW"
C3" ELSE DRAW"C1"
16 DRAW"S4BM22,191R22":FORJ=1TO5
:NEXTJ:RETURN
18 IFPPOINT(VAL(S1$(C)),191)<>3
THENDRAW"C3" ELSE DRAW"C1"
20 DRAW"BM"+S1$(C)+"R9":FORJ=1TO
5:NEXTJ:RETURN
22 IFPPOINT(VAL(LEFT$(S1$(C),3))
,VAL(RIGHT$(S1$(C),3)))<>3 THEND
RAW"C3" ELSEDRAW"C1"
24 DRAW"S4BM"+S1$(C)+"R9":RETURN
26 IFPPOINT(88,188)<>3 THENDRAW"
C3" ELSEDRAW"C1"
28 DRAW"BM88,188"+BB$+"BR24"+AA$
:RETURN
30 IFPPOINT(VAL(LEFT$(S1$(CO),3)
),16)=3 THENDRAW"C2" ELSEDRAW"C3
"
32 DRAW"BM"+S1$(CO)+"16R9":RETUR
N
34 DRAW"S4BM210,70BD35BL14 D2RFD
RFRFR3FR3FR3ER3ER3ERERUERU2;BL17
BU35":GOTO40
36 DRAW"S4BM210,70BD35BL14 D2RFD
RFRFR3FR3FR3ER3ER3ERERUERU2;BL17
BU35"
38 DRAW"S4BM210,70BD44BL14 U2REU
RERER3ER11FR3FRFRDFRD2;BL17BU44"
40 DRAW"L6GL3GLGLGLDGLGLDGLD2GLD
2GLD4GLD13R1;FD4RFD2RFD2RFDRFRFD
RFRFRFRFRFRFR11;ERERERERERERUERE
RUERU2ERU2ERU4ERU13L1;HU4LHU2LHU
2LHULHLHULHLHLHL3HL9"
42 DRAW"BD16BL5LHLHL3GLGLDRFRFR3
ERERU1;BR24LHLHL3GLGLDRFRFR3ERER
U1;BD5BL19DGLD3GLD4RFRFR4":RETUR
N
44 FORI=1TO L:DRAW"BM"+STR$(8*(I
-1))+",0R5L3D5L2R5":NEXTI:RETURN
50 IFZ>54 THENW=HH*5+5:GOTO55
51 IFZ>42 THENW=HH*5+4:GOTO55
52 IFZ>30 THENW=HH*5+3:GOTO55
53 IFZ>19 THENW=HH*5+2:GOTO55
54 IFZ>7 THENW=HH*5+1 ELSEW=HH*5
55 WW=W+15:IFWW>60 THENWW=WW-60
56 IFW>60 THEN W=W-60
57 H1$="M"+STR$(H(W,4))+","+STR$
(H(W,5))
58 H2$="M"+STR$(H(WW,4))+","+STR
$(H(WW,5))
59 IFW=0 THENH3$="M"+STR$(H(60,0
))+","+STR$(H(60,1)):GOTO61
60 H3$="M"+STR$(H(W-1,2))+","+ST
R$(H(W-1,3))
61 H4$="M"+STR$(H(W,0))+","+STR$
(H(W,1))
62 H5$="M"+STR$(H(W+1,2))+","+ST
R$(H(W+1,3))
63 M1$="M"+STR$(M(Z,2))+","+STR$
(M(Z,3))
64 ZZ=Z+15:IFZZ>60 THENZZ=ZZ-60
65 M2$="M"+STR$(M(ZZ,2))+","+STR
```

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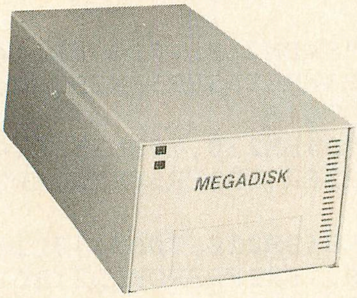

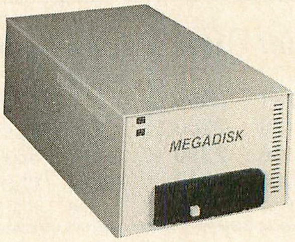

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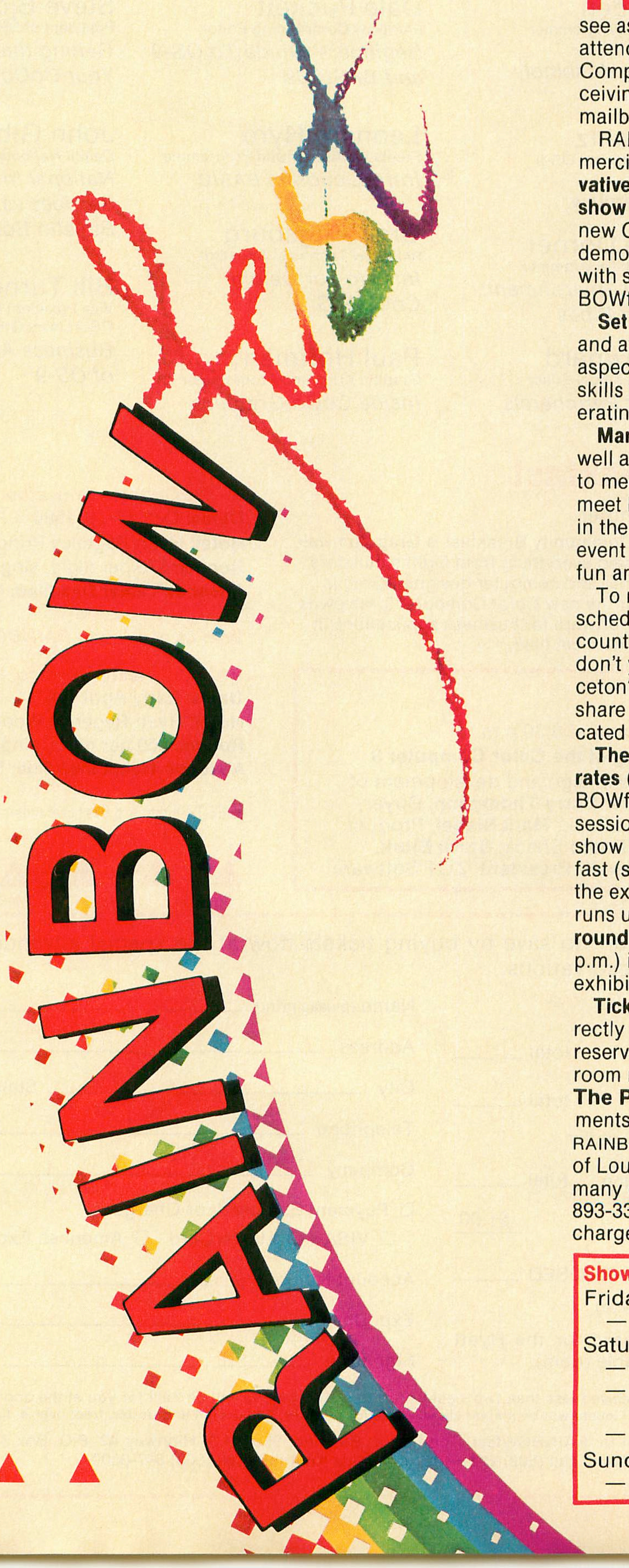
```
$(M(ZZ,3))
66 M3$="M"+STR$(M(Z,0))+","+STR$
(M(Z,1))
67 M4$="M"+STR$(M(Z+1,0))+","+ST
R$(M(Z+1,1))
68 DRAW"C4B"+H1$+H2$+H3$+H4$+H5$
+H1$+"C3B"+M1$+M2$+M3$+M4$+M1$:R
ETURN
70 DRAW"C1S10BM0,161"+N$(1):RETU
RN
72 DRAW"C4S10BM22,161"+N$(I):RET
URN
74 DRAW"C1S10BM22,161"+N$(I):RET
URN
76 DRAW"BM32,188"+MM$+II$+NN$+"B
L2UDBM186,188"+OO$+"BL2BU10D2BD8
BR4"+CC$+LL$+OO$+CC$+KK$:RETURN
78 DRAW"BM26,173"+BB$+EE$+FF$+OO
$+RR$+EE$+"BM+2,-5R2E2G2DBR2BDRB
H2R16L2H2F2DBL2BDLBM+12,3":DRAWA
A$+FF$+TT$+EE$+RR$:RETURN
100 DEFFNA(X)=INT(X+.5)
103 DIMX(60,1),Y(60,1),X1(12,1),
Y1(12,1),N$(12),M(61,3),H(61,5),
S1$(13),RS$(4)
106 XX=80:YY=80:R=80:RA=57.29577
95:RO=R-18:RI=R-21:RN=R-10:RE=R-
25:RF=RE-1: H1=.7: H2=.6: RM=4:
RH=8
109 FORI=1TO13:READS1$(I):NEXTI
112 DATA "52,191","66,191","86,1
91","100,191","000,191","014,191
","154,191","168,191","180,","19
4,","214,","228,","242,"
115 W$="T5O2L1...FC":RS$="GL4F#G
L2AL4GAL2BL4O+CO-BL2E":RS$(0)="T
5O2L2D"+RS$:RS$(2)="O2L4DDL2"+RS
$
118 RS$="L4AAL2GL4GGL2F#L4EF#L2.
..GP4":RS$(1)="O2"+RS$:RS$(3)=RS
$(1)
121 RS$="L4GBL2O+DO-L4BAL2GL4F#G
":RS$(4)="O2;XRS$;AGF#EL2D"
150 N$(0)="BDD9RFR5ERU9LHL5G1;BU
BR13":'10X12 +4 NUMERALS
152 N$(1)="BR6D11;U11BR8"
154 N$(2)="BD1RER5FRD3LGLGLGLGLD
3R8;BU11BR6"
156 N$(3)="BD1RER3FRFRD2LGL3R3FR
D3LGLGL3HL1;BU10BR14"
158 N$(4)="BD1D6R9L3U7D11;U11BR8
"
160 N$(5)="NR8D6R3ER3FRD4LGL5HL1
;BU10BR14"
162 N$(6)="BR7LDGLDGLDGLD4RFR5ER
U2LHL6;BU7BR13"
164 N$(7)="BD1RER7D4LGLD6;BU11BR
7"
166 N$(8)="BDD3RFGLD4RFR5ERU4LHE
RU3LHL5GLRBD3FR5E1;BU4BR6"
168 N$(9)="BR2R5FRD10U6L7HLU3RE1
;BR12"
170 N$(10)="BL6"+N$(1)+"BL4"+N$(
0)
172 N$(11)="BL6"+N$(1)+"BL4"+N$(
1)
174 N$(12)="BL8"+N$(1)+"BL4"+N$(
2)
176 AA$="U8RE2RF2RD4L7R7D4BR5":'
8X11 +4 LETTERS
178 BB$="U10R5FRD3LGL5R5FRD3LGL5
BR12"
180 CC$="BR7BULGL3HLU8RER3FRDBD8
BR5"
182 DD$="U10R3FRFRD6LGLGL3;BR12"
184 EE$="U10R7BD5BL3L4D5R7BR5"
186 FF$="U10R7BD5BL3L4D5BR12"
188 II$="BR2R5L3U10L2R5BD10BR5"
190 KK$="U10D5R3E4UDG4DF4BR5"
192 LL$="U10D10R7BR5"
194 MM$="U10RFRFD3RU3ERERD10BR3"
:'10WIDE
196 NN$="U10D2F7U9D10BR5"
198 OO$="BR2HLU8RER3FRD8LGL3BR10
"
200 RR$="U10R5FRD3LGL5R2F2RF2DBR
5"
202 TT$="BU10R7L3D10BR8"
204 ND$="BM194,49"+N$(2)+"BD11"+
NN$+DD$
300 FORO=0 TO15
310 Q=O*6/RA:S=SIN(Q):C=COS(Q)
320 X(O,0)=FNA(RO*S):X(30-O,0)=X
(O,0):X(30+O,0)=-X(O,0):X(60-O,0
)=-X(O,0)
330 X(O,1)=FNA(RI*S):X(30-O,1)=X
(O,1):X(30+O,1)=-X(O,1):X(60-O,1
)=-X(O,1)
340 Y(O,0)=FNA(RO*C):Y(30-O,0)=-
Y(O,0):Y(30+O,0)=-Y(O,0):Y(60-O,
0)=Y(O,0)
350 Y(O,1)=FNA(RI*C):Y(30-O,1)=-
Y(O,1):Y(30+O,1)=-Y(O,1):Y(60-O,
1)=Y(O,1):NEXTO
380 FORO=0TO3
390 Q=30*O/RA:S=SIN(Q):C=COS(Q):
X1(O,0)=FNA(RN*S)
400 IFX1(O,0)/2<>INT(X1(O,0)/2)
THENX1(O,0)=X1(O,0)+1
410 X1(6-O,0)=X1(O,0):X1(6+O,0)=
-X1(O,0):X1(12-O,0)=-X1(O,0)
420 Y1(O,0)=FNA(RN*C):Y1(6-O,0)=
-Y1(O,0):Y1(6+O,0)=-Y1(O,0):Y1(1
2-O,0)=Y1(O,0)
430 X1(O,1)=FNA(RE*S):X1(6-O,1)=
X1(O,1):X1(6+O,1)=-X1(O,1):X1(12
-O,1)=-X1(O,1)
```

Princeton

Oct. 17-19



RAINBOWfest is the only computer show dedicated exclusively to your Tandy Color Computer. Nowhere else will you see as many CoCo-related products or be able to attend free seminars conducted by the top Color Computer experts. It's the next best thing to receiving the latest issue of THE RAINBOW in your mailbox!

RAINBOWfest is a **great opportunity** for commercial programmers **to show off new and innovative products for the first time. Princeton is the show** to get the jump on new capabilities for the new CoCo 3. In exhibit after exhibit, there will be demonstrations, opportunities to experiment with software and hardware, and special RAINBOWfest prices.

Set your own pace between visiting exhibits and attending the valuable, free seminars on all aspects of your CoCo — from improving BASIC skills to working with the sophisticated OS-9 operating system.

Many people who write for THE RAINBOW — as well as those who are written about — are there to meet you and answer questions. You'll also meet lots of other people who share your interest in the Color Computer. It's a person-to-person event and a tremendous learning experience in a fun and relaxed atmosphere.

To make it easier for you to participate, we schedule RAINBOWfests in different parts of the country. If you missed the fun in Chicago, why don't you make plans now to join us in Princeton? For members of the family who don't share your affinity for CoCo, RAINBOWfest is located in an area with many other attractions.

The Hyatt Regency Princeton offers special rates ($79, single or double room) for RAINBOWfest. **The show opens Friday evening** with a session from 7 p.m. to 10 p.m. It's a daytime show Saturday — the CoCo Community Breakfast (separate tickets required) is at 8 a.m., then the exhibit hall opens promptly at 10 a.m. and runs until 6 p.m. **A special Saturday evening round table** examining the new CoCo 3 (6:30 p.m.) is sure to be a highlight. On Sunday, the exhibit hall opens at 11 a.m. and closes at 4 p.m.

Tickets for RAINBOWfest may be obtained directly from THE RAINBOW. We'll also send you a reservation form so you can get your special room rate.

The POSH way to go. Have your travel arrangements and hotel reservations handled through RAINBOW affiliate, POSH Travel Assistance, Inc., of Louisville. For the same POSH treatment many of our exhibitors enjoy, call POSH at (502) 893-3311. All POSH services are available at no charge to RAINBOWfest attendees.

Show Schedule:

Friday evening
- Exhibits open from 7 p.m. to 10 p.m.

Saturday
- CoCo Community Breakfast at 8a.m.
- Exhibits open at 10 a.m. and close at 6 p.m.
- Special round table at 6:30 p.m.

Sunday
- Exhibits open from 11 a.m. to 4 p.m.

Free Seminars

Mark Siegel
Product Manager, Software Engineering, Tandy/Radio Shack
An Insider's View of the New CoCo 3

Jim Reed
RAINBOW Managing Editor
Writing for Publication

Jeffrey Parker
Independent Programmer and Author
Getting Your CoCo To Talk To Your MS-DOS

Fred Scerbo
RAINBOW Contributing Editor
Using Computers in Education

Bill Barden
Independent Programmer and Author
Beginning Assembly Language

Brian Lantz
President, National OS-9 Users Group
OS-9 Overview

George Dorner
OS-9 Veteran Programmer
The OS-9 Environment: Tools and Pipes

Dan Downard
RAINBOW Technical Editor
A Look at Peripherals

Dale Puckett
RAINBOW Contributing Editor
Beginners' Guide To OS-9 and BASIC09

Leonard Hyre
Freelance Author and Programmer
Introduction to BASIC

Cray Augsburg
RAINBOW Technical Assistant
Intro to our Delphi CoCo SIG

Paul Hoffman
Graphic Artist and Programmer
Inside CoCo Graphics

Steve Bjork
President of SRB Software
Getting the Most from Your CoCo 3

John Gibney
Delphi National Sales Director
National Information Services vs. Local Bulletin Boards

Bill Turner
Vice President National OS-9 Users Group
Business Applications of OS-9

CoCo Community Breakfast

Greg Zumwalt — CoCo 3 Programmer

Our keynote speaker for the traditional CoCo Community Breakfast is Greg Zumwalt, one of the early CoCo specialists who has created everything from flight simulators to computer games. An independent programmer and computer designer, Greg is one of the select few writing Tandy software for the new Color Computer 3. He owns ZCT Software, of Tulsa, Okla., and also writes software for business applications in such areas as aviation, the oil industry and the medical field.

▲ SPECIAL EVENT!

Saturday Evening Round-Table Discussion at 6:30 p.m.

The Design, Development and Marketing of the Color Computer 3

Exclusive: Listen to the key people in the design and development of the Color Computer 3! Featured Speakers: **Barry Thompson**, Buyer, Computer Merchandising, Tandy/Radio Shack; **Mark Siegel**, Product Manager, Software Engineering, Tandy/Radio Shack; **Steve Bjork**, President, SRB Software; and **Greg Zumwalt**, President, ZCT Software.

RAINBOWfest - Princeton, New Jersey
Dates: Oct. 17-19, 1986
Hotel: Hyatt Regency Princeton
Rooms: $79 per night, single or double
Advance Ticket Deadline: Oct. 10, 1986

Join us at a future RAINBOWfest!

RAINBOWfest - Chicago, Illinois
Dates: Early April 1987
Hotel: Hyatt Regency Woodfield
Rooms: $60 per night, single or double
Advance Ticket Deadline: March 25, 1987

FREE T-Shirt to first five ticket orders received from each state.

YES, I'm coming to **Princeton!** I want to save by buying tickets now at the special advance sale price. Breakfast tickets require advance reservations.

Please send me:

_____ Three-day tickets at $9 each total _____

_____ One-day tickets at $7 each total _____

Circle one: Friday Saturday Sunday

_____ Saturday CoCo Breakfast at $12 each total _____

Handling Charge $1 $1.00

TOTAL ENCLOSED _____

(U.S. Currency Only, Please)

☐ Also send me a hotel reservation card for the Hyatt Regency Princeton ($79, single or double room).

Name (please print) _____

Address _____

City _____ State _____

Telephone _____ ZIP _____

Company _____

☐ Payment Enclosed, or Charge to:
☐ VISA ☐ MasterCard ☐ American Express

Account Number _____

Exp. Date _____

Signature _____

Advance ticket deadline: Oct. 10,1986. Orders received less than two weeks prior to show opening will be held for you at the door. Tickets will also be available at the door at a slightly higher price. Tickets will be mailed six weeks prior to show. Children 4 and under, free; over 4, full price.

Make checks payable to: The RAINBOW. Mail to: RAINBOWfest, The Falsoft Building, 9509 U.S. Highway 42, P.O. Box 385, Prospect, KY 40059. To make reservations by phone, in Kentucky call (502) 228-4492, or outside Kentucky call (800) 847-0309.

```
440 Y1(O,1)=FNA(RE*C):Y1(6-O,1)=
-Y1(O,1):Y1(6+O,1)=-Y1(O,1):Y1(1
2-O,1)=Y1(O,1):NEXTO
450 PCLS:SCREEN1,0:CLS:CIRCLE(XX
,YY),R:PAINT(XX,YY-R+1),2,4:PSET
(XX,YY,1)
460 FORZ=0 TO 60:DRAW"BM"+STR$(X
X+X(Z,0))+","+STR$(YY-Y(Z,0))+"M
"+STR$(XX+X(Z,1))+","+STR$(YY-Y(
Z,1)):NEXTZ
470 FORZ=1TO12
480 DRAW"BM"+STR$(XX+X(Z*5,1))+"
,"+STR$(YY-Y(Z*5,1))+"M"+STR$(XX
+X1(Z,1))+","+STR$(YY-Y1(Z,1))
490 DRAW"BM"+STR$(XX+X1(Z,0)-4)+
","+STR$(YY-Y1(Z,0)-5)+N$(Z):NEX
TZ
500 FORZ=1TO15
510 Q=(Z*6-3)/RA:S=SIN(Q):C=COS(
Q)
520 T=FNA(RF*S):M(Z,0)=XX+T:M(31
-Z,0)=XX+T:M(30+Z,0)=XX-T:M(61-Z
,0)=XX-T
530 T=FNA(RF*C):M(Z,1)=YY-T:M(31
-Z,1)=YY+T:M(30+Z,1)=YY+T:M(61-Z
,1)=YY-T:NEXTZ
540 FORZ=1TO60
550 Q=(135+6*Z)/RA
560 S=SIN(Q):M(Z,2)=FNA(RM*S)+XX
:H(Z,4)=FNA(RH*S)+XX
570 C=COS(Q):M(Z,3)=YY-FNA(RM*C)
:H(Z,5)=YY-FNA(RH*C)
580 H(Z,0)=XX+FNA(X(Z,1)*H1):H(Z
,1)=YY-FNA(Y(Z,1)*H1)
590 H(Z,2)=XX+FNA(X(Z,1)*H2):H(Z
,3)=YY-FNA(Y(Z,1)*H2):NEXTZ
600 M(0,0)=M(60,0):M(0,1)=M(60,1
):M(0,3)=M(60,3):M(0,2)=M(60,2)
610 M(61,0)=M(1,0):M(61,1)=M(1,1
):M(61,2)=M(1,2):M(61,3)=M(1,3)
620 H(0,0)=H(60,0):H(0,1)=H(60,1
):H(0,2)=H(60,2):H(61,2)=H(1,2):
H(0,3)=H(60,3):H(61,3)=H(1,3):H(
0,4)=H(60,4):H(0,5)=H(60,5)
1000 ' level 1
1010 L=1:DRAW"S4C4":GOSUB44
1020 DRAW"C4BM70,186S10"+OO$+"BU
10D2BD8BR4"+CC$+LL$+OO$+CC$+KK$
1030 D$="":NW=0:NR=0:Z=0:T=0
1040 HH=RND(12)
1050 IFINSTR(1,D$,CHR$(HH+64))<>
0 THEN1040
1060 DRAW"S4":GOSUB50
1070 'GET ANSWER
1080 GOSUB14:R$=INKEY$:IFR$=""TH
EN1080
1090 IFASC(R$)<49 OR ASC(R$)>57
THEN1080
1100 IFR$="1"THENDRAW"C4BM0,186S
10BU10"+N$(1):I=1:GOTO1130
1110 I=VAL(R$)
1120 GOSUB72
1130 A$=R$
1140 GOSUB14:R$=INKEY$:IFR$=""TH
EN1140
1150 IFR$=CHR$(13)THEN IFA$="1"T
HENGOSUB70:DRAW"C4BM22,161"+N$(1
):GOTO1270 ELSE1270
1160 IFR$<>CHR$(8) THEN1190
1170 IFVAL(A$)=1 THENGOSUB70 ELS
EGOSUB74
1180 A$="":I=0:GOTO1080
1190 IFA$<>"1" THEN1140
1200 IFASC(R$)<48 OR ASC(R$)>50
THEN 1140
1210 I=VAL(R$)
1220 GOSUB72
1230 A$=A$+R$
1240 GOSUB14:R$=INKEY$:IFR$=""TH
EN1240
1250 IFR$=CHR$(8)THENGOSUB74:A$=
LEFT$(A$,1):I=0:GOTO1140
1260 'CHECK ANSWER
1270 DRAW"C1S4BM22,191R22":IFVAL
(A$)=HH THEN1320
1280 DRAW"C4":GOSUB38:PLAYW$:NW=
NW+1: IFT<>0 THEN T=0:GOTO1330
1290 IFLEN(A$)=2 THENGOSUB70
1300 GOSUB74
1310 DRAW"C1":GOSUB36:T=1:DRAW"C
4S4XND$;":GOTO1080
1320 DRAW"C2":GOSUB34:PLAYRS$(0)
:NR=NR+1:D$=D$+CHR$(HH+64):T=0
1330 R$=INKEY$:IFR$="" THEN1330
1340 IFR$="^" THENGOSUB8000
1350 DRAW"C1":GOSUB36:DRAW"S4XND
$;"
1360 IFLEN(A$)=2 THENGOSUB70
1370 GOSUB74
1380 DRAW"S4C2B"+M1$+M2$+M3$+M4$
+M1$+"B"+H1$+H2$+H3$+H4$+H5$+H1$
1390 IFNR<12 THEN1040
1400 PRINT"LEVEL 1   RIGHT";NR;"
  WRONG";NW:SCREEN1,0
1410 IFNW>3 THEN1030
1420 DRAW"C1BM70,186S10"+OO$+"BU
10D2BD8BR4"+CC$+LL$+OO$+CC$+KK$
2000 ' levels 2 & 3
2010 L=2:DRAW"C4S4":GOSUB44
2020 DRAW"C4":GOSUB76
2030 IFL=2 THEN DRAW"BM76,188BR6
"+AA$+FF$+TT$+EE$+RR$ ELSEGOSUB4
4:DRAW"BM76,188"+BB$+EE$+FF$+OO$
+RR$+EE$
2040 D$="":E$="":NW=0:NR=0
2050 HH=RND(12)
```

```
2060 IFINSTR(1,D$,CHR$(HH+64))<>
0 THEN2050
2070 M=RND(7)
2080 IFINSTR(1,E$,STR$(M))<>0 TH
EN2070
2090 IFL=2 THENZ=5*(M-1) ELSEZ=5
*(M+5)
2100 DRAW"C2BM"+S1$(5)+"R9BM"+S1
$(6)+"R9BM"+S1$(7)+"R9BM"+S1$(8)
+"R9"
2110 GOSUB50
2120 A$="":C=5
2130 GOSUB22:R$=INKEY$:IFR$=""TH
EN2130
2140 IFR$=CHR$(32) THENDRAW"C1BM
"+S1$(C)+"R9":GOTO2180
2150 IFR$=CHR$(8) THEN IFC=5THEN
2130 ELSEC=C-1:DRAW"C1BM"+S1$(C)
+"BU14"+N$(I):A$=LEFT$(A$,LEN(A$
)-1):I=VAL(RIGHT$(A$,1)):GOTO213
0
2160 IFASC(R$)<48 OR ASC(R$)>57
THEN2130
2170 I=VAL(R$):DRAW"C4BM"+S1$(C)
+"BU14"+N$(I)+"BM"+S1$(C)+"C1R9"
2180 A$=A$+R$
2190 C=C+1
2200 IFC<9THEN2130
2210 C=8
2220 GOSUB22:R$=INKEY$:IFR$=""TH
EN2220
2230 IFR$=CHR$(8) THENDRAW"C1BM"
+S1$(C)+"BU14"+N$(I):A$=LEFT$(A$
,LEN(A$)-1):I=VAL(RIGHT$(A$,1)):
GOTO2130
2240 IFR$<>CHR$(13) THEN2220
2250 DRAW"C1BM"+S1$(C)+"R9"
2260 IFL=3THEN2280
2270 IFVAL(LEFT$(A$,2))=Z AND VA
L(RIGHT$(A$,2))=HH THEN2330 ELSE
2300
2280 H=VAL(RIGHT$(A$,2))-1:IFH<1
 THENH=12
2290 IFVAL(LEFT$(A$,2))=60-Z AND
 H=HH THEN2330
2300 DRAW"C4":GOSUB38:NW=NW+1:PL
AYW$:IFT<>0 THENT=0:GOTO 2340
2310 DRAW"C1":GOSUB36:FORI=5TO8:
DRAW"BM"+S1$(I)+"BU14"+N$(VAL(MI
D$(A$,I-4,1))):NEXTI
2320 T=1:DRAW"C4XND$;":GOTO2100
2330 DRAW"C2":GOSUB34:PLAYRS$(L-
1):NR=NR+1:D$=D$+CHR$(HH+64):E$=
E$+STR$(M):T=0
2340 R$=INKEY$:IFR$="" THEN2340
2350 IFR$="^" THENGOSUB8000
2360 DRAW"C1XND$;":GOSUB36
2370 FORI=5TO8:DRAW"C1BM"+S1$(I)
+"BU14"+N$(VAL(MID$(A$,I-4,1))):
NEXTI
2380 DRAW"C2B"+M1$+M2$+M3$+M4$+M
1$+"B"+H1$+H2$+H3$+H4$+H5$+H1$
2390 IFNR<7 THEN2050
2400 IFL=3 THEN2430
2410 PRINT"LEVEL 2   RIGHT";NR;"
  WRONG";NW:SCREEN1,0
2420 IFNW<3 THENL=3:DRAW"BM76,18
8C1R6"+AA$+FF$+TT$+EE$+RR$+"C4":
GOTO2030 ELSE2040
2430 PRINT"LEVEL 3   RIGHT";NR;"
  WRONG";NW:SCREEN1,0
2440 IFNW>2 THEN2040
2450 DRAW"C1BM76,188"+BB$+EE$+FF
$+OO$+RR$+EE$:GOSUB76
4000 ' level 4
4010 L=4:DRAW"S4C4":GOSUB44:GOSU
B76:AR$="BM110,183R9L2H2F2DBL2BD
LBE2L16R2E2G2DBR2BDR"
4020 D$="":E$="":NW=0:NR=0
4030 HH=RND(12)
4040 IFINSTR(1,D$,CHR$(HH+64))<>
0 THEN4030
4050 M=RND(12)
4060 IFINSTR(1,E$,CHR$(M+64))<>0
 THEN4050
4070 Z=(M-1)*5:GOSUB50
4080 A$="":C=5
4090 DRAW"C2XAR$;BD3BL17"+BB$+"B
R24"+AA$
4100 GOSUB78
4110 DRAW"C2BM"+S1$(5)+"R9BM"+S1
$(6)+"R9BM"+S1$(7)+"R9BM"+S1$(8)
+"R9"
4120 GOSUB22:R$=INKEY$:IFR$="" T
HEN4120
4130 IFR$=CHR$(32) THENDRAW"C1BM
"+S1$(C)+"R9":GOTO4170
4140 IFR$=CHR$(8) THEN IFC=5 THE
N4120 ELSEC=C-1:DRAW"C1BM"+S1$(C
)+"BU14"+N$(I):A$=LEFT$(A$,LEN(A
$)-1):I=VAL(RIGHT$(A$,1)): GOTO4
120
4150 IFASC(R$)<48 OR ASC(R$)>57
THEN4120
4160 I=VAL(R$):DRAW"C4BM"+S1$(C)
+"BU14"+N$(I)+"BM"+S1$(C)+"C1R9"
4170 A$=A$+R$
4180 C=C+1
4190 IFC<7 THEN4120 ELSE4230
4200 DRAW"C2":GOSUB78
4210 IFRT$="A" THENDRAW"C1BM82,1
88"+AA$+FF$+TT$+EE$+RR$ ELSE DRA
W"C1BM76,188"+BB$+EE$+FF$+OO$+RR
$+EE$
4220 DRAW"C2XAR$;"
4230 GOSUB26:RT$=INKEY$:IFRT$=""
 THEN4230
4240 IFRT$=CHR$(8) THENDRAW"C2BM
```

```
88,188"+BB$+"BR24"+AA$:C=C-1:DRA
W"C1BM"+S1$(C)+"BU14"+N$(I):A$=L
EFT$(A$,LEN(A$)-1):I=VAL(RIGHT$(
A$,1)):GOTO4120
4250 IFASC(RT$)<65 OR ASC(RT$)>6
6 THEN4230
4260 DRAW"C1XAR$;BD3BL17"+BB$+"B
R24"+AA$
4270 GOSUB78
4280 IFRT$="A" THENDRAW"C4BM82,1
88"+AA$+FF$+TT$+EE$+RR$ ELSEDRAW
"C4BM76,188"+BB$+EE$+FF$+OO$+RR$
+EE$
4290 GOSUB22:R$=INKEY$:IFR$="" T
HEN4290
4300 IFR$=CHR$(32) THENDRAW"C1BM
"+S1$(C)+"R9":GOTO4340
4310 IFR$=CHR$(8) THEN IFC=7 THE
N4200 ELSEC=C-1:DRAW"C1BM"+S1$(C
)+"BU14"+N$(I):A$=LEFT$(A$,LEN(A
$)-1):I=VAL(RIGHT$(A$,1)): GOTO4
290
4320 IFASC(R$)<48 OR ASC(R$)>57
THEN4290
4330 I=VAL(R$):DRAW"C4BM"+S1$(C)
+"BU14"+N$(I)+"BM"+S1$(C)+"C1R9"
4340 A$=A$+R$
4350 C=C+1
4360 IFC<9 THEN4290
4370 C=8
4380 GOSUB22:R$=INKEY$:IFR$="" T
HEN4380
4390 IFR$=CHR$(8) THENDRAW"C1BM"
+S1$(C)+"BU14"+N$(I):A$=LEFT$(A$
,LEN(A$)-1):I=VAL(RIGHT$(A$,1)):
GOTO4290
4400 IFR$<>CHR$(13) THEN4380
4410 DRAW"C1BM"+S1$(C)+"R9"
4420 Z$=RIGHT$(STR$(Z),2)
4430 IFRT$="A" THEN4470
4440 IFZ=0 THENH=VAL(RIGHT$(A$,2
)):Z=60:GOTO4460
4450 H=VAL(RIGHT$(A$,2))-1:IFH<1
 THENH=12
4460 IFVAL(LEFT$(A$,2))=60-Z AND
 H=HH THEN4520 ELSE4480
4470 IFVAL(LEFT$(A$,2))=Z AND VA
L(RIGHT$(A$,2))=HH THEN4520
4480 DRAW"C4":GOSUB38:PLAYW$:NW=
NW+1:IFT<>0 THENT=0:GOTO4530
4490 C=5:T=1:FORI=5TO8:DRAW"C1BM
"+S1$(I)+"BU14"+N$(VAL(MID$(A$,I
-4,1))):NEXTI
4500 IFRT$="A" THENDRAW"BM82,188
"+AA$+FF$+TT$+EE$+RR$ ELSEDRAW"B
M76,188"+BB$+EE$+FF$+OO$+RR$+EE$
4510 GOSUB36:DRAW"C4XND$;":GOTO4
080
4520 T=0:DRAW"C4BM180,30"+N$(HH)
+"BD3DBD3DBU8BR6"+N$(VAL(LEFT$(Z
$,1)))+N$(VAL(RIGHT$(Z$,1)))+"C2
":GOSUB34:PLAYRS$(3):NR=NR+1:E$=
E$+CHR$(M+64):D$=D$+CHR$(HH+64)
4530 R$=INKEY$:IFR$="" THEN4530
4540 IFR$="^" THENGOSUB8000
4550 IFRT$="A" THENDRAW"C1BM82,1
88"+AA$+FF$+TT$+EE$+RR$ ELSEDRAW
"C1BM76,188"+BB$+EE$+FF$+OO$+RR$
+EE$
4560 DRAW"C1XND$;BM180,30"+N$(HH
)+"BD3DBD3DBU8BR6"+N$(VAL(LEFT$(
Z$,1)))+N$(VAL(RIGHT$(Z$,1))):GO
SUB36
4570 FORI=5TO8:DRAW"C1BM"+S1$(I)
+"BU14"+N$(VAL(MID$(A$,I-4,1))):
NEXTI
4580 DRAW"C2B"+M1$+M2$+M3$+M4$+M
1$+"B"+H1$+H2$+H3$+H4$+H5$+H1$
4590 IF NR<12 THEN4030
4600 PRINT"LEVEL 4   RIGHT";NR;"
   WRONG";NW:SCREEN1,0
4610 IFNW>2 THEN4020
4620 DRAW"C1":GOSUB76
5000 ' level 5
5010 L=5:DRAW"C4":GOSUB44
5020 D$="":NW=0:NR=0:DRAW"C4BM80
,185UBU3U"
5030 DRAW"C2BM52,191R9BR5R9BR11R
9BR5R9"
5040 H=RND(24)
5050 IFINSTR(1,D$,CHR$(H+64))<>0
 THEN5040
5060 IFH>12 THENHH=H-12 ELSEHH=H
5070 Z=RND(60)-1
5080 GOSUB50
5090 A$="":C=1
5100 GOSUB18:R$=INKEY$:IFR$=""TH
EN5100
5110 IFR$=CHR$(32) THENA$=A$+R$:
DRAW"C1BM"+S1$(C)+"R9":GOTO5160
5120 IFR$=CHR$(8) THEN IFC=1THEN
 5100 ELSEC=C-1:DRAW"C1BM"+S1$(C
)+"BU14"+N$(I):A$=LEFT$(A$,LEN(A
$)-1):I=VAL(RIGHT$(A$,1)):GOTO51
00
5130 IFASC(R$)<48 OR ASC(R$)>57
THEN5100
5140 I=VAL(R$):DRAW"C4BM"+S1$(C)
+"BU14"+N$(I)+"C1BM"+S1$(C)+"R9"
5150 A$=A$+R$
5160 C=C+1
5170 IFC<5 THEN5100
5180 C=4
5190 GOSUB18:R$=INKEY$:IFR$=""TH
EN5190
5200 IFR$=CHR$(8) THENDRAW"C1BM"
+S1$(C)+"BU14"+N$(I):A$=LEFT$(A$
,LEN(A$)-1):I=VAL(RIGHT$(A$,1)):
```

```
GOTO5100
5210 IFR$<>CHR$(13) THEN5190
5220 DRAW"C1BM"+S1$(C)+"R9"
5230 IFVAL(LEFT$(A$,2))=HH AND Z
=10*VAL(MID$(A$,3,1))+VAL(RIGHT$
(A$,1)) THEN5270
5240 DRAW"C4":GOSUB38:PLAYW$:NW=
NW+1:IFT<>0 THENT=0:GOTO5280
5250 FORI=1TO4:DRAW"C1BM"+S1$(I)
+"BU14"+N$(VAL(MID$(A$,I,1))):NE
XTI
5260 DRAW"C1":GOSUB36:T=1:DRAW"C
4XND$;C2BM52,191R9BR5R9BR11R9BR5
R9":GOTO5090
5270 DRAW"C2":GOSUB34:PLAYRS$(4)
:NR=NR+1:D$=D$+CHR$(H+64):T=0
5280 R$=INKEY$:IFR$="" THEN5280
5290 IFR$="^" THENGOSUB8000
5300 DRAW"C1XND$;":GOSUB36
5310 FORI=1TO4
5320 DRAW"C1BM"+S1$(I)+"BU14"+N$
(VAL(MID$(A$,I,1))):NEXTI
5330 DRAW"C2B"+M1$+M2$+M3$+M4$+M
1$+"B"+H1$+H2$+H3$+H4$+H5$+H1$
5340 IFNR<24 THEN5030
5350 PRINT"LEVEL 5   RIGHT";NR;"
   WRONG";NW:SCREEN1,0
5360 IFNW>4 THEN5020
5370 DRAW"C1BM80,185UBU3U":GOSUB
44
5380 PRINT:PRINT" YOUR ANSWERS A
RE SHOWN ABOVE.":FORI=0TO4:PLAYR
S$(I):NEXTI:PLAYRS$+"L2...AP4;L4
DDGP4P2AP4P2L8BBL4BO+CO-BL2EL4AA
L1GF#L2...G"
5390 PRINT"FOR MORE PRACTICE, WH
ICH LEVEL  WOULD YOU LIKE TO STA
RT AT?":INPUT" TYPE LEVEL (1-5)"
;L
5400 PRINTSTRING$(32,195):L=ABS(
L):SCREEN1,0
5410 ON L GOTO1000,2010,2020,401
0,5000
5420 END
8000 ' user control
8010 COLOR3,1
8020 ZT=Z:HT=HH
8030 LINE(176,0)-(253,17),PSET,B
F
8040 COLOR4,1
8050 DRAW"S4C2B"+M1$+M2$+M3$+M4$
+M1$+"B"+H1$+H2$+H3$+H4$+H5$+H1$
:DRAW"C1BM208,5DBD3D"
8060 DRAW"C4BM180,16R9BR5R9BR11R
9BR5R9BR5R9"
8070 CO=9:A1$=""
8080 GOSUB30:R$=INKEY$:IFR$="" T
HEN8080
```

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```
8090 IFASC(R$)<48 OR ASC(R$)>57 THEN8080
8100 A1$=A1$+R$
8110 DRAW"C1BM"+S1$(CO)+"2"+N$(VAL(R$))+"C3BM"+S1$(CO)+"16R9"
8120 CO=CO+1
8130 IFCO<13 THEN8080
8140 Z=VAL(RIGHT$(A1$,2)):HH=VAL(LEFT$(A1$,2))
8150 IFHH>12 OR HH<1 OR Z>60 THEN8260
8160 GOSUB50
8170 GOSUB30:R$=INKEY$:IFR$="" THEN8170
8180 IFR$="T" THEN8250
8190 IFR$="R" THEN8290
8200 IFR$<>CHR$(10) THEN8170
8210 LINE(176,0)-(253,17),PRESET,BF
8220 DRAW"C2B"+M1$+M2$+M3$+M4$+M1$+"B"+H1$+H2$+H3$+H4$+H5$+H1$
8230 Z=ZT:HH=HT
8240 RETURN
8250 DRAW"C2B"+M1$+M2$+M3$+M4$+M1$+"B"+H1$+H2$+H3$+H4$+H5$+H1$:' new time
8260 CO=9:N1=INT(HH/10):N2=HH-N1*10:N3=INT(Z/10):N4=Z-N3*10
8270 DRAW"C3BM"+S1$(CO)+"2"+N$(N1)+N$(N2)+"BM"+S1$(CO+2)+"2"+N$(N3)+N$(N4)
8280 GOTO8060
8290 CO=9:HN=HH:N1=INT(HH/10):N2=HH-N1*10:N3=INT(Z/10):N4=Z-N3*10:' run clock
8300 ZN=Z+1
8310 IFZN>=60 THENZN=0:HN=HH+1:IFHN>12 THENHN=1
8320 R$=INKEY$:IFR$="S" THENCO=13:GOTO8170
8330 DRAW"C3BM"+S1$(CO)+"2"+N$(N1)+N$(N2)+"BM"+S1$(CO+2)+"2"+N$(N3)+N$(N4)
8340 DRAW"C2B"+M1$+M2$+M3$+M4$+M1$+"B"+H1$+H2$+H3$+H4$+H5$+H1$
8350 Z=ZN:HH=HN
8360 GOSUB50
8370 N1=INT(HH/10):N2=HH-N1*10:N3=INT(Z/10):N4=Z-N3*10
8380 DRAW"C1BM"+S1$(CO)+"2"+N$(N1)+N$(N2)+"BM"+S1$(CO+2)+"2"+N$(N3)+N$(N4)
8390 GOTO8300
```

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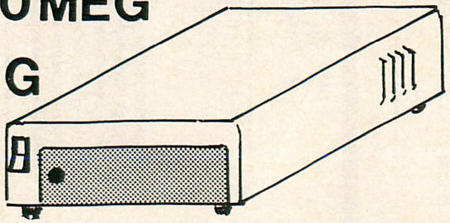

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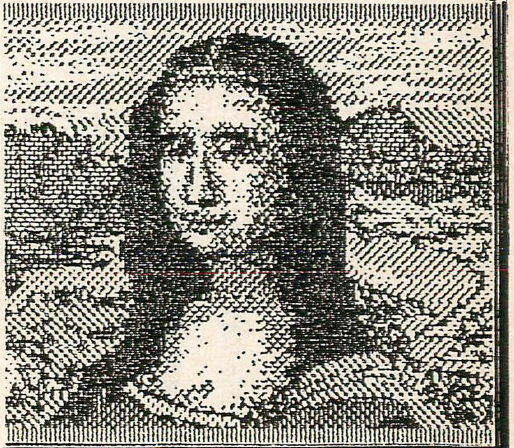

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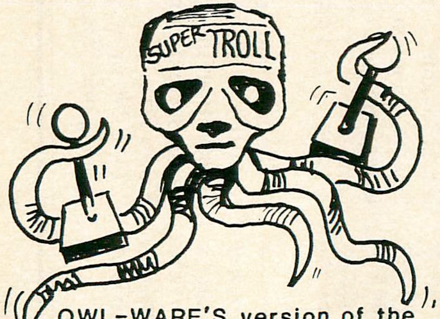

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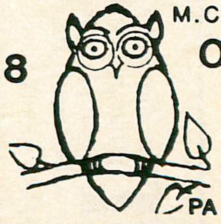

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Mystery Word Puzzles

By Steve Blyn
Rainbow Contributing Editor

This month's column presents a program to help learn spelling or vocabulary lists. Depending on the words used, this program could be applied to any grade level. We arbitrarily entered typical fourth-grade spelling words.

The words are entered on the program's DATA lines. These are contained in lines 370 on. Each DATA line contains a spelling word and a key word to act as a clue. They are used by the program as A$ and B$. If you wish to convert this program to a foreign language program, the key word could be the English equivalent of the mystery word.

This program actually contains two games in one. They both use the idea of finding the correct spelling of the mystery word. The students who tested this game for us found the second game was a little more difficult than the first game. The games are chosen randomly by the program.

Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He owns Computer Island and lives in Staten Island, New York.

The first game presents a partial mystery word such as "xfra" along with a key word given as an aid, such as "border." The clues given would be "-x" and "+me." This appears on the screen as:

```
XFRA - X + ME
```

The student subtracts the first clue (x) from the beginning of the word and adds the next clue (me) to the end of the word. The mystery word is therefore, "frame." The routine for the first game is contained in lines 150 to 200.

The second game is slightly more difficult. A key word is also supplied as an aid, but the clue is harder to apply. Let's suppose the word we are looking for is "frame" once again. The word "frame" is given, minus any one of its letters such as:

```
FRME +A or FRAE +M
```

The solution to this type of puzzle requires a higher order of thought process than the first game. The routine for the second game is contained in lines 220 to 280.

Line 290 prints the key word clue for either game. The clue is the same for both games. Lines 300 to 330 ask for the student's answer, which is AN$. AN$ is then compared to the correct answer A$(R). If the student is incorrect, the correct answer is displayed.

Each type of game appears randomly. Lines 130 and 140 randomize the use of the two. The beginning routine for the first game is contained in lines 150 to 200, and those for the harder game are in lines 220 to 280. Lines 290 through 360 contain the rest of the program needed for both games.

It is possible that only one of the two games is suitable for your child or students. Customize this game to an easier or harder level by deleting the lines of the routine you want to omit. We found that having the two ways of playing increased student interest in the game. The element of surprise added to the enjoyment of using the program.

We have not included scoring in this game. We felt this is the type of program where the student shortly masters all of the material. You may of course, add a scorecard after every ten or twenty turns. Line 60 would be a convenient place to add a counter for turns and Line 320 would be the place to insert a counter for correct responses.

After each example, the child may press either 'E' to end the progam or ENTER to go on to the next example. As written, the program continues until the child presses the 'E' key. We would hope that the material being tested is mastered at that point.

We at Computer Island are always interested in hearing from our readers. Your experiences with our programs and suggestions for changes are most helpful to us. ☐

160 178
290 171
430 22
END 207

The listing: SPELPUZL

```
10 REM"SPELLING PUZZLES-GRADE 4"
20 REM"STEVE BLYN,COMPUTER ISLAN
D SOFTWARE,NY,1986"
30 CZ=RND(-TIMER)
40 N=20:DIM A$(N),B$(N)
50 FOR T=1 TO N:READ A$(T),B$(T)
: NEXT T
60 CLS RND(8):PRINT@8,"WORD   PU
ZZLES";
70 PRINT@64,"PUZZLE-"
80 PRINT@128,"YOUR KEY WORD -"
90 PRINT@192,"MYSTERY WORD ? -"
100 R=RND(N):'CHOOSE A RANDOM #
110 L=LEN(A$(R))
120 H=64+RND(26)
130 G=RND(2)
140 IF G=1 THEN 150 ELSE 220
150 REM"EASIER GAME"
160 PRINT@73,CHR$(H);
170 FOR A=1 TO L-2:PRINTMID$((A$
(R)),A,1);:SOUND 240,2:NEXT A
180 PRINT"  ";"- ";CHR$(H);"  +
";
190 PRINT RIGHT$(A$(R),2)
200 PRINT@320,"FOLLOW THE 2 CLUE
S AT THE TOP."
210 GOTO 290
220 REM"HARDER GAME"
230 X=RND(L)-2
240 IF X<2 THEN 230:'PREVENT BEL
OW ZERO
250 PRINT@73, LEFT$(A$(R),X);
260 FOR A=X+2 TO L:PRINT MID$((A
$(R)),A,1);:SOUND 240,2:NEXT A
270 PRINT"   + ";MID$(A$(R),X+1,
1)
280 PRINT@320,"ADD THE EXTRA LET
TER SOMEWHERE."
290 PRINT@145,B$(R)
300 PRINT@210,"";
310 LINEINPUT AN$:PRINT@320,""
320 IF AN$=A$(R) THEN PRINT@332,
"CORRECT";:PLAY"O4L200ECEGGEC":G
OTO 340
330 PRINT@320,"   SORRY, THE ANS
WER IS - ":PRINT@362,A$(R);
340 PRINT@422,"PRESS ENTER TO GO
 ON";
350 EN$=INKEY$
360 IF EN$=CHR$(13) THEN 60 ELSE
 IF EN$="E" THEN END ELSE 350
370 DATA SNEAKERS,SHOES
380 DATA SCOLD,YELL
390 DATA PRICE,COST
400 DATA MIDDLE,CENTER
410 DATA OCEAN,SEA
420 DATA LAUGH,SMILE
430 DATA LESSON,LEARN
440 DATA FRIENDS,BUDDIES
450 DATA HAMMER,NAILS
460 DATA GOWN,DRESS
470 DATA FRIED,COOKED
480 DATA FRAME,BORDER
490 DATA DELIVER,GIVE
500 DATA EARTH,SOIL
510 DATA EVERYONE,ALL
520 DATA FEAST,EAT
530 DATA ENJOY,LIKE
540 DATA CANDLE,BURN
550 DATA BASEBALL,BATS
560 DATA WHEEL,ROUND
```

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Tandy Grants and the Status of Educational Computers

By Michael Plog, Ph.D.
Rainbow Contributing Editor

The September issue, and school is starting. It's time to leave the fun of summer for the rigors of classrooms once again. For those using computers in classrooms, there is some good news. The Tandy Corporation supports proposals for those interested in using Tandy/Radio Shack computers for instruction. You can write a proposal to Tandy and possibly get money for your pet project.

The Tandy grant program started in 1982. Since then, Tandy has awarded more than one million dollars in computers and software equipment to nonprofit educational institutions and individual educators. The company typically receives 150 to 200 proposals per grant cycle and funds about 10 percent of them. The competition is rather stiff for these grants.

This grant cycle from Tandy has two areas of competition. One is for creative use of microcomputers in education. Give your dreams free rein if you write for this one. The proposal must indicate a "creative" use of microcomputers in education. The deadline for this grant is September 30 (better hurry).

The second type of grant is for using microcomputers in instructional management. This is not computer-assisted instruction, but management of instruction with computers. The deadline for this grant is December 31.

If you are interested in writing for either of these grants, contact Bill Gattis, Tandy Educational Grants Program, 1400 One Tandy Center, Fort Worth, Texas 76102, (817) 390-3832. He will send you all the details on how to apply. Grants are awarded in the form of TRS-80 hardware, software and accessories from Tandy's Radio Shack division. Awards do not exceed $10,000. Of course, you can buy a lot of Color Computer equipment for that amount.

If you write for a Tandy grant, you might help determine how computers are used in your schools. A lot of schools have computers and are using them in a variety of ways. Johns Hopkins University is interested in how computers are used in schools and has conducted the Second National Survey of Instructional Uses of School Computers. This study gathered information about the 1984-85 school year from more than 10,000 teachers and principals in over 2,300 elementary and secondary schools, and is the most extensive survey on school computer use to date.

Computer use in schools has grown, as you might expect. Nearly all secondary schools and elementary schools have begun to use computers in instructional programs. Ninety percent of U.S. school children attend schools that have at least one computer. However, this does not mean ninety percent of students use computers. During the 1984-85 school year, nearly half of elementary and middle school pupils, and as many as one-third of high school students made some use of computers at school. There are computer-using schools and there are schools where computers are not used to any great extent.

During an average week at a typical computer-using school, more than one-quarter of the student body used computers. At a typical kindergarten through sixth grade computer-using school, 30 percent of students used computers during an average week. At a typical high school, 21 percent of students used computers.

One-fourth of all U.S. teachers used computers regularly with students dur-

---

Michael Plog received his doctorate degree from the University of Illinois. He has taught social studies in high school, worked in a central office of a school district and currently is employed at the Illinois State Board of Education.

ng the 1984-85 school year. Elementary teachers tend to use computers more "regularly" than secondary teachers: 37 percent for elementary teachers and 15 percent for secondary teachers. Because secondary schools are larger than elementary schools, roughly the same number of teachers used computers regularly during the year. Whether at elementary, middle or high school, about five teachers per school are regular users.

The ways students use computers differ by grade level. In elementary schools, more than half of computer use by students involves drill and practice and tutorial programs. The tutorial programs are generally computer assisted instruction (CAI). Only about 12 percent of elementary students' time is spent writing computer programs. Mathematics and language arts (English and reading) are the major subjects using computers at this level. In 1983, the typical elementary school student using computers was on the machine about 20 minutes per week. In 1985, the time spent with the machine had increased to 35 minutes each week.

High school students, by contrast, spend only 16 percent of their computer time on CAI, but half of the time dealing with programming. Computer literacy and programming are the dominant subjects for high school students, with business education and mathematics next. Time with the machines has increased at the secondary school also. In 1983, secondary students spent 45 minutes per week dealing with computers. By 1985, this had increased to 90 minutes each week. There are two reasons for more computer time per student at upper grades. More computers are available at each school and each computer is used more than in elementary schools.

Across all school levels, time spent on computers can be divided into thirds. About one-third of the time is for CAI, one-third for programming, and one-third for all other academic work, including discovery learning and word processing.

In elementary schools, computers tend to be spread out, with a smaller number of machines at each location, but more locations. High schools tend to cluster computers, such as establishing a computer lab. Middle schools tend to have computer labs even more than elementary or high schools. More than three-fifths of all computers in middle schools are in labs, and the labs are just as large (as many machines) as the ones in high schools.

Computers in labs tend to be used more than computers in classrooms. This is partly because students doing programming use more computer time than students doing CAI, and lab locations tend to be more devoted to programming.

The Johns Hopkins study considered all computers used in schools during 1985. The Color Computer was not reported separately, but in the category of "other low-cost color" machines. About three-fourths of the machines in this category were used in eighth grade or lower. We can deduce, therefore, that the Color Computer is primarily an elementary school machine. Over half of terminals used in secondary schools were connected to mainframes, 16-bit microcomputers and the rest of the TRS-80 line.

This is a brief presentation of the findings of the computer use survey. There are six newsletters containing results of the entire study. If you want the complete series of all six newsletters, send $7.50 to Computer Survey Newsletters, Center for Social Organization of Schools, Johns Hopkins University, 3505 N. Charles St., Baltimore, MD 21218.

This survey might be useful to you if you decide to write for one of the Tandy grants. Background information will strengthen the proposal. If anyone reading this does apply for the Tandy grants, please let me know. Write to me at 829 Evergreen, Chatham, IL 62629.

CORRECTIONS

"CoCo Dares You to Name That Tune" (June 1986, Page 66): Marge Rutter has written to clarify some points on her program. First, there is a comma missing from Line 852 of Listing 2. This problem occurred due to a printing error. Line 852 should read:

```
852 PRINT@238,"AND"
```

Secondly, Marge neglected to mention the proper procedure for passing in the Bid-A-Note section. In order to pass, you must enter `PASS` or `P`. Just pressing ENTER does not work and will eventually cause an error.

"Picprt: Good Things Come in All Sizes" (May 1986, Page 72): Mark Sullins has written to correct an error in his *Picprt* routines. In one portion of *Normal*, Mark used commands to set the Baud rate at 2400. Unfortunately this overrides the Baud rate that the user sets. To correct the situation, add the following line to Listing 1. This replaces the offending bytes with NOP instructions.

```
33 FOR I=&H7D05 TO &H7D08:POKE I
,&H12:NEXT I
```

For quicker service, Corrections will be posted on Delphi as soon as they are available in the Info on Rainbow topic area of the database. Just type `DATA` at the CoCo SIG prompt and `INFO` at the Topic? prompt.

Develop spelling skills and the ability to recognize misspelled words

I Before E Except After C

(Or when it's like A as in Neighbor and Weigh)

By Donald Turowski

Let's see, what's the correct spelling? Is it "received," "recieved," or "reseived"?

Need a program to help you with your child's spelling words? I know — you already have a couple. In fact, you're probably saying that these programs are more trouble to run than simply sitting down and asking the children their words. Well, you may be right! But, if you're looking for a program that will help your child's spelling skills and also the ability to recognize when a word is misspelled, then *SPELDRIL* is the answer.

SPELDRIL is set up like some standardized tests in schools. Three spellings of a word are shown to the child and then he must choose the correct one. This type of approach helps the child recognize potential misspelled words while also developing the skills for correct spelling.

Once the child determines the correct spelling, then he must carefully type in the word. This also helps with keyboard layout recognition on the computer.

This program has been used both at the elementary and middle/junior high school levels. It generates a printer copy as a sort of "report card" for the parent or teacher.

For teachers, this program can be used for each unit or chapter throughout the year. Since each file only uses one granule on a diskette, over 60 units or chapter lists can be kept on file for review or for the next year's classes.

After loading and typing `RUN`, a title screen and then a menu appears with five choices: Prepare a new word list, Save a word list, Load a word list, Start spelling recognition and End.

A printer copy can be selected (or a screen report card). This provides feedback, and is helpful if the student or child retakes the same list of words for reinforcement. If a word is missed, the correct spelling is presented. This is, of course, the type of immediate feedback the child needs. Various messages and audible feedback on correct and incorrect responses are provided,

SPELDRIL was written on a 64K CoCo with a single disk drive option. However, it should be able to run on 16K Extended BASIC Color Computers with no problems. A cassette option was not included, but it should be easy to adapt it for cassette.

(You may direct questions about this program to the author at 1236 Ninth Avenue, Natrona Heights, PA 15065, 412-224-6529. Please enclose an SASE when writing.) □

Sample Report

```
JIMMY'S REPORT:
Word List is ==>TESTFILE
------------------------------------------
YOU MISSED ==>FEBRUARY
YOU MISSED ==>RECEIVED
YOU MISSED ==>RECOMMEND
YOU MISSED ==>RESPONSIBLE
YOU MISSED ==>PARALLEL
==========================================
JIMMY----> 15  CORRECT OUT OF 20
==========================================
```

Donald Turowski has a bachelor's degree in education and teaches algebra and computer literacy in the Burrells School District in Natrona Heights, Pennsylvania. He is married and has two children.

70	173	4090	90
1060	90	4200	152
2090	103	4360	191
4015	147	END	29

Editor's Note: To modify this program for cassette operation, change #1 in lines 2030, 2070, 3030 and 3070 to #-1. This causes a data file to be opened on cassette rather than disk. Also, you will need to use PRINT#-1 in Line 2050 instead of WRITE#1.

The listing: SPELDRIL

```
10 REM PROGRAM TO RECOGNIZE
   SPELLING PATTERNS, ETC.
14 CO=0:WR=0
15 CLEAR 3000:DIM A$(20),B$(20),
C$(20),D$(20)
20 CLS(RND(8)):PRINT@32*6+5,"spe
lling recognition";:PRINT@32*13+
1,"programmed by d.turowski(1986
)";:PRINT@32*15+1,"[suggestions
by t. gallagher]";
25 PLAY"L16O3GF#GEFGL8AL16GF#GL2
8CDEFGABO4CP8":FOR WW=1 TO 1000:
NEXT WW
26 CLS(8):FOR WW=1 TO 16:PRINTTA
B(5);"spelling recognition":NEXT
 WW:FOR WW=1 TO 21:PRINT@32*15+W
W,"GET READY!";:SOUND 200,1:FORX
X=1TO100:NEXT XX:PRINT@32*15+WW,
"          ";:NEXT WW
30 FOR D=1 TO 20:SOUND D,1:NEXT
D:CLS(RND(8))
40 CO=0:WR=0:CLS(RND(8)):PRINT@3
2+6,"spelling recognition";:PRIN
T@32*3,"<1>PREPARE NEW WORD LIST
"
50 PRINT@32*4,"<2>SAVE WORD LIST
"
60 PRINT@32*5,"<3>LOAD WORD LIST
"
70 PRINT@32*6,"<4>start SPELLING
 RECOGNITION       PROGRAM"
80 PRINT@32*7,"<5>END SESSION
90 PRINT@32*10+5,"**enter your c
hoice**";: INPUT C:PLAY"T224O5L6
CECE"
100 IF C<1 OR C>5 THEN 40
110 ON C GOTO 1000,2000,3000,400
0,5000
1000 REM ROUTINE TO PREPARE NEW
     WORD LIST
1010 CLS(RND(8)):PRINT"YOU WILL
BE PERMITTED TO ENTER  20 WORDS
FOR EACH FILE.        FOLLOW TH
E PROMPTS ON THE SCREEN"
1015 PRINT"you must enter the co
rrect      spelling as one of th
e three    choices!!!!!!!!!!!!!
":PRINTSTRING$(32,".")
1020 FOR X=1 TO 20
1025 PRINT"FILE WORD #";X:PRINTS
TRING$(32,"=")
1030 INPUT"enter spelling #1";A$
(X)
1040 INPUT"enter spelling #2";B$
(X)
1050 INPUT"enter spelling #3";C$
(X)
1060 PRINT"is correct spelling 1
,2, or 3 ?":INPUT B
1061 IF B<1 OR B>3 THEN PRINT"EN
TER ONLY 1,2, OR 3!":GOTO 1060
1062 IF B=1 THEN D$(X)=A$(X)
1063 IF B=2 THEN D$(X)=B$(X)
1064 IF B=3 THEN D$(X)=C$(X)
1070 NEXT X
1080 SOUND 200,3:SOUND 200,3:PRI
NT"**BE SURE TO SAVE THIS FILE!!
**":PRINT"do you want to save it
 now?";:INPUT V$:IF LEFT$(V$,1)=
"Y" THEN 2000
1090 PRINT"press <enter> to retu
rn to menu":INPUT RR$:GOTO 40
2000 REM ROUTINE TO SAVE WORD
     LIST TO DISK
2010 CLS(RND(8)):PRINT@8,"save f
ile routine";
2020 PRINT@32*3,"enter name for
file":INPUT F$
2030 OPEN"O",#1,F$
2040 FOR X=1 TO 20
2050 WRITE#1, A$(X),B$(X),C$(X),
D$(X)
2060 NEXT X
2070 CLOSE #1
2080 SOUND 123,2:SOUND 123,2:PRI
NT"file saved to disk!!!!!!!!!!"
;
2090 PRINT@32*14,"press <enter>
to return to menu";:INPUT RR$
2100 GOTO 40
3000 REM ROUTINE TO LOAD WORD
     LIST FROM DISK
3010 CLS(RND(8)):PRINT@8,"load f
ile routine";
3020 PRINT@32*3,"enter name of f
ile":INPUT F$
3030 OPEN"I",#1,F$
3040 FOR X=1 TO 20
3050 INPUT#1,A$(X),B$(X),C$(X),D
$(X)
3060 NEXT X
3070 CLOSE#1
3080 SOUND 123,2:SOUND 123,2:PRI
NT"file loaded from disk!!!!!!!!
```

```
!!";
3090 PRINT@32*14,"press <enter>
to return to menu";:INPUT RR$
3100 GOTO 40
4000 REM ROUTINE TO REVIEW WITH
     STUDENT THE VARIOUS
     SPELLINGS OF WORDS
4010 CLS(RND(8)):IF A$(1)="" THE
N PRINT"sorry, there are no word
s       loaded into this program
!!!!!!!":PRINT"please check if a
 file has been loaded----press <
enter> to       return to menu":I
NPUT RR$:GOTO 40
4015 PRINT"PLEASE <ENTER> YOUR N
AME":INPUT NA$:PRINT"DO YOU HAVE
 A PRINTER ON";:INPUT Z$:IF LEFT
$(Z$,1)="Y" THEN FL=1 ELSE FL=0:
4016 SOUND 200,3:CLS(RND(8))
4017 IF FL=1 THEN PRINT#-2,NA$;"
'S REPORT:":PRINT#-2,"Word List
is ==>";F$:PRINT#-2,STRING$(60,"
-")
4018 GOSUB 6000
4020 FOR X=1 TO 20
4030 PRINT@32*2+9,"word number";
X;
4040 PRINT@32*5,"type the correc
tly spelled word";
4050 PRINT@32*6,A$(X)
4060 PRINT@32*7,B$(X)
4070 PRINT@32*8,C$(X)
4080 PRINT@32*10,"the correct sp
elling is........":PRINT@32*13,
" ";:INPUT AN$
4085 IF FL=1 AND AN$<>D$(X) THEN
 PRINT#-2,"YOU MISSED ==>";D$(X)
4090 IF AN$=D$(X) THEN 4200 ELSE
 4300
4100 FOR QQ=1 TO 2000:NEXT QQ:CL
S(RND(8)):NEXT X
4110 PRINT"YOU GOT ";CO;" CORREC
T OUT OF         20 POSSIBLE CORR
ECT"
4115 IF FL=1 THEN PRINT#-2,STRIN
G$(60,"="):PRINT#-2,NA$;"---->";
CO;" CORRECT OUT OF 20":PRINT#-2
,STRING$(60,"=")
4120 IF CO>=16 THEN PRINT "NICE
JOB, YOU DID VERY WELL!":PLAY"V1
9;T4O3L3CO2L8BO3L4DCP8L3FL8EL4GF
P8AP16AP16AP16AP16L2AP2L4GFGA-AL
3B-L4FGAB-O4CDO3L3AL8GL2F":GOTO
40
4130 IF( CO<16 AND CO>=14) THEN
PRINT "NOT BAD.  NEXT TIME, TRY
TO GET AT LEAST  16 CORRECT IF Y
OU CAN.":PLAY"L16O3GF#GEFGL8AL16
GF#GL28CDEFGABO4CP8":FORTT=1TO15
00:NEXT TT:GOTO 40
4135 PLAY"V25T3O3P4L2CL3CL8CL2CE
-L8DL3DL8CL3CO2L8BO3L2CP2"
4140 PRINT"YOU NEED TO TRY THIS
PROGRAM    AGAIN UNTIL YOU GET A
T LEAST    14 CORRECT.  STAND BY
, THE      PROGRAM WILL RE-START
 SHORTLY.":FOR QQ=1 TO 3500:NEXT
 QQ:CO=0:GOTO 4000
4200 PLAY"T250;O3ABCDEFGABCDEFGA
BCDEFG":CORRECT=CORRECT+1:Z=RND(
5)
4210 ON Z GOTO 4220,4230,4240,42
50,4260
4220 PRINT "VERY GOOD!":GOTO 410
0
4230 PRINT "EXCELLENT!":GOTO 410
0
4240 PRINT "GOOD JOB!!":GOTO 410
0
4250 PRINT "ALL RIGHT!":GOTO 410
0
4260 PRINT "YOU'RE RIGHT!":GOTO
4100
4300 REM WRONG RESPONSES
4310 PLAY"T20O2ACACACACAC":WRONG
=WRONG+1:Z=RND(5)
4320 ON Z GOTO 4330,4340,4350,43
60,4370
4330 PRINT"NOPE! IT IS ";D$(X):G
OTO 4100
4340 PRINT"SORRY! IT IS ";D$(X):
GOTO 4100
4350 PRINT"NOT QUITE. IT'S ";D$(
X):GOTO 4100
4360 PRINT"OOPS, IT'S ";D$(X):GO
TO 4100
4370 PRINT"NO, IT'S REALLY ";D$(
X):GOTO 4100
5000 END
6000 REM ROUTINE FOR QUICK LOOK
     AT FILE WORDS
6010 CLS(RND(8)):PRINT"YOU WILL
BE GIVE A SHORT, QUICK LOOK AT T
HE WORDS IN THIS       PROGRAM..
. LOOK AT THEM QUICKLY!"
6020 PRINT@32*14+3,"press any ke
y to continue";:EXEC44539
6030 CLS(RND(8))
6040 FOR X=20 TO 1 STEP -1
6050 PRINT D$(X),
6060 NEXT X
6070 FOR VV=1 TO 3500:NEXT VV
6080 PRINT@32*15+10,"time is up!
!!";:SOUND 200,2:SOUND 200,2:FOR
 VV=1 TO 400:NEXT VV:CLS:RETURN
```

Telewriter-64™

the Color Computer Word Processor

- **3 display formats: 51/64/85 columns × 24 lines**
- **True lower case characters**
- **User-friendly full-screen editor**
- **Right justification**
- **Easy hyphenation**
- **Drives any printer**
- **Embedded format and control codes**
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- **No hardware modifications required**

THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

> *...one of the best programs for the Color Computer I have seen...*
>
> — Color Computer News, Jan. 1982

TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

RAINBOW
CERTIFICATION
SEAL

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

> *...truly a state of the art word processor... outstanding in every respect.*
>
> — The RAINBOW, Jan. 1982

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Apple II is a trademark of Apple Computer, Inc.; Atari is a trademark of Atari, Inc.; TRS-80 is a trademark of Tandy Corp; MX-80 is a trademark of Epson America, Inc.

Graph-O-Matic

By Jeff Harper

A fast way to plot 3-D functions using the CoCo

My program, *3DFNCPLT*, is a three-dimensional function plot which quickly graphs any function in a 3-D Cartesian coordinate system.

To achieve 3-D graphing, the program plots the function over the range of 'Y' coordinates (from smallest to largest) for each 'X' coordinate. It then graphs the function over the range of 'X' coordinates (again from smallest to largest) over the range of 'Y' coordinates. This produces a stunning graph of the function which resembles a net having been draped over a solid of the function.

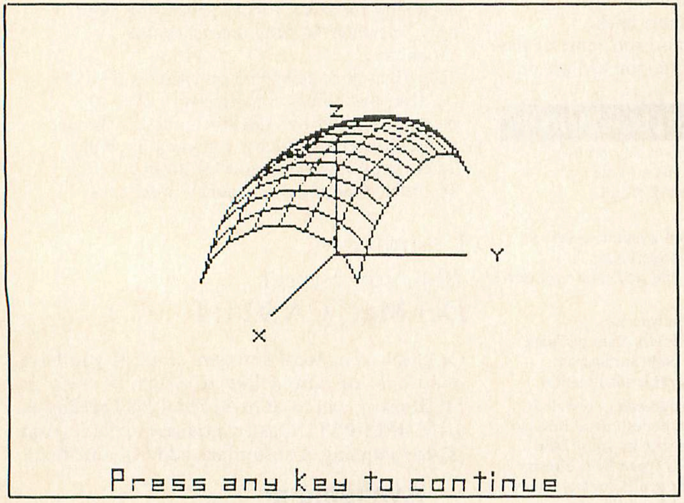
The program first asks if you want to have the 'X', 'Y', 'Z' coordinate axes drawn on the screen. Then you are prompted to enter the function to be plotted. The computer displays `Z=` at which point you should enter a function. A typical response might be `COS (Y)+SIN(X)`.

The computer then requests the smallest and largest 'X' and 'Y' coordinate values. These values can have any range dependent only upon the function to be plotted. I usually get a good idea of what a particular function looks like by using a range of values from –3 to 3 for both the 'X' and 'Y' coordinates. Attempts to plot off of the screen are cropped so as not to result in an error. 'X' coordinate values are graphed coming toward you from the back of the screen, 'Y' coordinate values are graphed horizontally and 'Z' coordinate values are graphed vertically.

A unique and particularly useful feature of this program is that it lets the user enter the function to be plotted while the program is running. The user does not need to stop program execution, change a program line and then rerun the program. The transformation of your function into a line of BASIC code is simple but interesting.

Once the function to be plotted is entered, the routine beginning in Line 970 looks for the location of Line 410

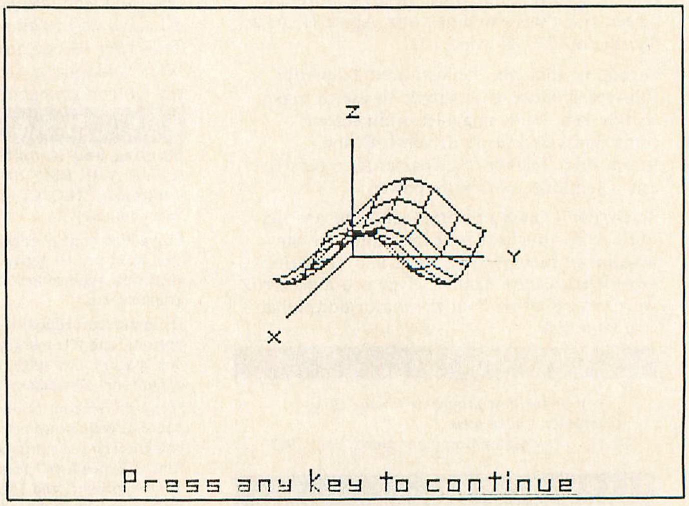
Jeff Harper is a high school math teacher who enjoys programming the CoCo as a hobby. He is also a computer programming instructor for enrichment classes held each summer.



```
Press any key to continue
```

$z=\sqrt{19-x^2-y^2}$

x=[-3,3], y=[-3,3]



```
Press any key to continue
```

z=cosy+sinx

x=[-3,3], y=[-3,3]

in memory. Once located, the string containing your function is tokenized into BASIC program Line 410. Note that this is done before the program ever reaches Line 410. Once the tokenizing is complete, the program continues and eventually executes Line 410 in the subroutine beginning at Line 360. This technique can easily be applied in other programs of your own creation.

While *3DFNCPLT* requires a 16K Extended CoCo, the routine that transforms the function into a BASIC program line will work on any size or system configuration including Color BASIC.

(You may direct questions about this program to Mr. Harper at 430 Swing Avenue, Findlay, OH 45840, 419-423-8878. Please enclose an SASE when writing.) ☐

Editor's Note: In Line 410 of the listing below, replace the REM marks (') with spaces. This line is used for entry of the function you wish to plot and the spaces are required in order to reserve space for your function.

The listing: 3DFNCPLT

```
10 '3 DIMENSIONAL FUNCTION PLOT
20 'WITH INTERACTIVE FUNCTION
30 'DESIGNATION
40 '
50 '           BY
60 '
70 '      JEFF  HARPER
80 '        02/15/85
90 '
100 PMODE 4,1
110 COLOR 0,1:PCLS1
120 LINE(0,0)-(255,191),PSET,B
130 '**************************
140 '* STEP VALUES FOR DETAIL *
150 '* AND STRIPE SPACING     *
160 '**************************
170 S1=.5:S2=.5:S3=1
180 '
190 CLS
200 PRINT"AXES DRAWN ON SCREEN (
Y/N)?";
210 A$=INKEY$:IF A$="" THEN 210
ELSE IF A$<>"N" AND A$<>"Y" THEN
 210 ELSE PRINT A$:PRINT
220 '
230 '***************************
240 '*FIND LINE 410 IN MEMORY, *
250 '*GET EQUATION & TRANSFORM *
260 '*IT INTO BASIC CODE AT    *
270 '*LINE 410 BEFORE WE GET   *
280 '*THERE IN THE PROGRAM.    *
290 '***************************
300 GOSUB 1270
310 GOTO540
320 '
330 '***********************
340 '*RADIAN TRANSFORMATION*
350 '***********************
360 RADIAN=(X*-.7071068)
370 '
380 '*************************
390 '*FUNCTION TO PLOT IN 410*
400 '*************************
410 Z=X^2+Y^2'''''''''''''''''''
''''''''''''''''''''''''''''''''
'''''''''''''''''''''
420 '
```

PRINTERS!!!

NEW! Star Micronics NX-10	$295
Okidata 192 (Parallel)	$370
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- Fits inside printer — No AC Plugs
- Optional external switch ($5.00 extra) frees parallel port for use with other computers
- $49.95 (plus $3.00 shipping)

SP-3 INTERFACE for MOST OTHER PRINTERS:

- 300-19,200 BAUD rates
- External to printer — No AC Plugs
- Built in modem/printer switch—no need for Y-cables or plugging/unplugging cables
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```
430 '************************
440 '*SCALE IMAGE TO SCREEN*
450 '************************
460 NX=10*(Y+RADIAN)+128
470 NY=192-(10*(Z+RADIAN)+96)
480 IF NX<0 THEN NX=0
490 IF NX>255 THEN NX=255
500 IF NY<0 THEN NY=0
510 IF NY>191 THEN NY=191
520 RETURN
530 '
540 PRINT:INPUT "SMALLEST X VALU
E";BX
550 INPUT"LARGEST  X VALUE";EX
560 INPUT"SMALLEST Y VALUE";BY
570 INPUT"LARGEST  Y VALUE";EY
580 SCREEN 1,1
590 IF A$="N" THEN 720
600 '
610 '************************
620 '*DRAW X, Y, AND Z AXIS*
630 '************************
640 LINE(128,51)-(128,96),PSET:L
INE-(178,96),PSET:LINE(127,96)-(
103,120),PSET
650 DRAW"BM190,98 U2NH2E2"
660 DRAW"BM96,130 E2NH2NE2F2"
670 DRAW "BM126,42 NR4E4L4"
680 '
690 '***********************
700 '*PLOT FUNCTION VALUES*
710 '***********************
720 FOR X=BX TO EX STEP S1
730 FOR Y=BY TO EY STEP S2
740 GOSUB 360
750 IF Y=BY THEN LINE(NX,NY)-(NX
,NY),PSET:GOTO770
760 LINE-(NX,NY),PSET
770 NEXT Y
780 NEXT X
790 '
800 '********************
810 '*PLOT CROSS STRIPES*
820 '********************
830 X=BX
840 FOR Y=BY TO EY STEP S3
850 GOSUB 360
860 X2=NX:Y2=NY
870 X=X+.5
880 IF X>EX THEN X=BX:GOTO 910
890 GOSUB 360
900 LINE(NX,NY)-(X2,Y2),PSET:GOT
O 860
910 NEXT Y
920 '
930 DRAW"BM40,189 U8R4D4NL4BR4"
940 DRAW"ND4R4BR4"
950 DRAW"D4R4BU2NL4U2NL4BR4"
960 DRAW"NR4D2R4D2NL4BR4"
970 DRAW"R4U2L4U2R4BR8"
980 DRAW"R4D2L4D2R4U4BR4"
990 DRAW"ND4R4D4BR4"
1000 DRAW"R4U2L4U2BR4ND2BR8"
1010 DRAW"NU4D1ND3NE3NF3E1BR6"
1020 DRAW"D4R4BU2NL4U2NL4BR4BD4"
1030 DRAW"R4U2L4U2BR4ND2BR8"
1040 DRAW"BU1R2NR2NU2D5BR4"
1050 DRAW"U4R4D4NL4BR8"
1060 DRAW"NR4U4R4BR4"
1070 DRAW"ND4R4D4NL4BR4"
1080 DRAW"U4R4D4BR4"
1090 DRAW"BU5R2NR2NU2D5BR5"
1100 DRAW"U4BU2U1BD7BR4"
1110 DRAW"U4R4D4BR4"
1120 DRAW"NU4R4NU4BR4"
1130 DRAW"NR4U2NR4U2R4D2"
1140 A$=INKEY$:A$=""
1150 A$=INKEY$:IF A$="" THEN 115
0 ELSE 100
1160 '
1170 '***************************
1180 '* A BASIC SELF-PROGRAMMER*
1190 '* AND INTERPRETER        *
1200 '* BY JEFF HARPER         *
```

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```
1210 '* 08/02/84                *
1220 '*                         *
1230 '*ADAPTED FOR THE ECB COCO*
1240 '*FROM AN ARTICLE IN US-80*
1250 '* MAY/JUN 1981 PG.90     *
1260 '**************************
1270 MM=PEEK(25)*256+PEEK(26)
1280 LN=410
1290 MS=INT(LN/256):LS=LN-256*MS
1300 M=MM
1310 IF PEEK(M+3)<>LS OR PEEK(M+
2)<>MS THEN M=PEEK(M)*256+PEEK(M
+1):GOTO1310
1320 ML=M+4
1330 PRINT"ENTER FUNCTION TO PLO
T"
1340 LINE INPUT"Z=";E$
1350 E$="Z="+E$
1360 M=ML
1370 FOR N=1 TO LEN(E$)
1380 Q=ASC(MID$(E$,N,1))
1390 IF Q=43 THEN Q=171:GOTO1510
 '+
1400 IF Q=45 THEN Q=172:GOTO1510
 '-
1410 IF Q=42 THEN Q=173:GOTO1510
 '*
1420 IF Q=47 THEN Q=174:GOTO1510
 '/
1430 IF Q=61 THEN Q=179:GOTO1510
 '=
1440 IF Q=94 THEN Q=175:GOTO1510
 '^
1450 IF Q=67 THEN Q=255:Q1=149:N
=N+2:GOTO1510'cos
1460 IF Q=84 THEN Q=255:Q1=150:N
=N+2:GOTO1510'tan
1470 IF Q=76 THEN Q=255:Q1=153:N
=N+2:GOTO1510'log
1480 IF Q=73 THEN Q=255:Q1=129:N
=N+2:GOTO 1510' int
1490 IF Q=83 THEN N=N+2:IF MID$(
E$,N-1,1)="I"THEN Q=255:Q1=133 E
LSE Q=255:Q1=155' sin or sqr
1500 IF Q=65 THEN N=N+2:IF MID$(
E$,N-1,1)="T"THEN Q=255:Q1=148 E
LSE Q=255:Q1=130' atn or abs
1510 POKE M,Q:IF Q=255 THEN M=M+
1:POKE M,Q1
1520 M=M+1
1530 NEXT
1540 IF PEEK(M)<>0 THEN POKE M,3
2:M=M+1:GOTO1540
1550 RETURN
```

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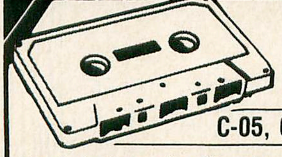

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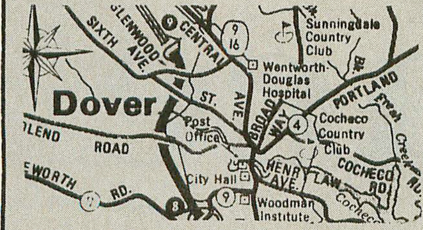

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Your Face

By Mike Rigsby

Many people are purchasing computers to help their child prepare for the new technological age. *Face* is a game designed to catch the attention of very young children because it requires nothing but pounding on the keyboard. Loosely based on the old potato toy that had changeable face parts, the voice output and graphics enable a user to create hundreds of faces by swapping parts electronically. Operation of *Face* requires 32K Extended Color BASIC and will not run with the disk controller plugged in. The game will operate on a 16K machine if voice output is deleted.

The game begins with production of a pleasant face accompanied by five key words: eyes, ears, nose, mouth and hair. A cursor slowly rotates past these words. Press any key (except SHIFT, which does nothing, or BREAK, which stops the program) and the screen changes to a display of appropriate parts and pronounces the name of the part. The new display shows a choice of features complete with rotating cursor awaiting another keyboard entry to signify a choice. When a key is pressed, a beep is heard and the face is redrawn with the newly selected part in place.

Tiny youngsters are exposed to the keyboard in a friendly manner; they learn to read the five key words, they develop a longing "to 'play' on the 'puter" and they enjoy themselves. It's also fun to watch adults creating faces. A hazard in this game is the BREAK key because it halts the action and requires a restart.

Extensive BASIC graphics are used in the game, but alphanumeric characters are

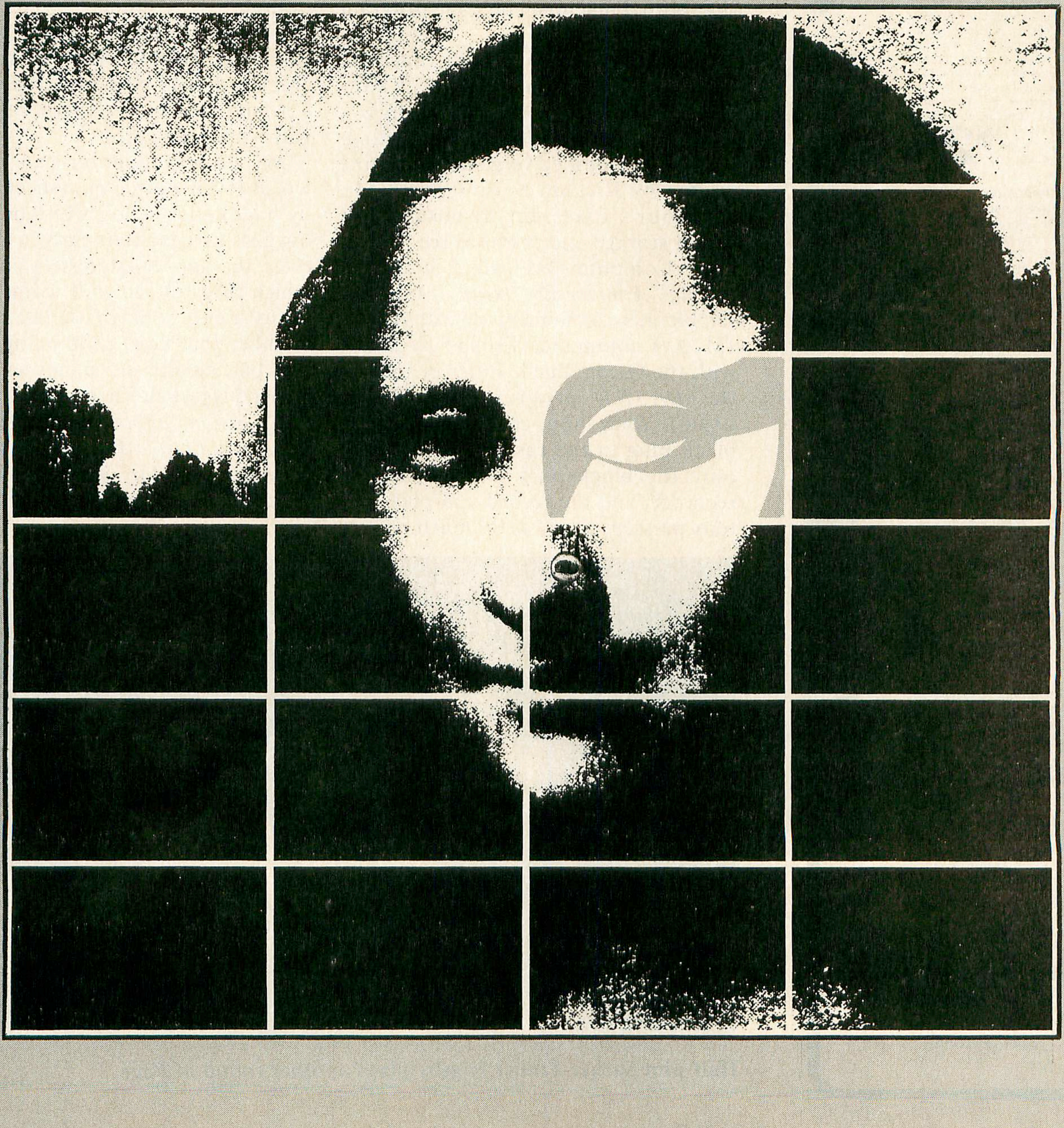
---

Mike Rigsby, author and inventor, builds animated display windows and repairs antique toys. He also invented a program so that Teddy Ruxpin's™ animation will fit any voice on tape.

32K
ECB

16K
Mod.

or Mine?



not supported in the graphics mode. Lines 10 through 260 (A$ through Z$) represent the letters 'A' through 'Z'. Although they are not all used in this program, I left them for anyone desiring a ready-made alphabet. Lines 720 through 1210 cause the cursor to rotate past the words on the face screen.

Pressing a key moves execution to Line 2000 where selection of the proper alternate screen is made, those choices being Line 2050 for eyes, 2200 for ears, 2400 for nose, 2600 for mouth and 2800 for hair. Within these routines a choice is made by key depression and control is transferred to Line 1. Actual drawing of the face and words takes place between 320 and 710.

To operate *Face* without voice output (required for 16K operation), delete lines 2054, 2204, 2404, 2604 and 2804. Operation of *Face* with voice requires that both a machine language program and *Face* be loaded.

To develop the voice code (machine language program) I used Radio Shack's *EDTASM+*. In *EDTASM*'s editor mode, type in the *Sound* listing. *Sound* is a modified version of a routine written by Richard Seymour. For Mr. Seymour's excellent discussion on sound storage and retrieval see "Teach Your Computer To Talk," *80 Micro Special Anniversary Issue*, 1983. Assemble this text in memory with the A/IM/AO command. Escape to BASIC with the Q command. Enter or load in the *BASND* program (written in BASIC). Voice input comes through the black plug in the cassette cable. With only the black plug attached to the recorder, and the record and play buttons pressed, the cassette machine acts an an amplifier. I recommend using a separate amplifier and microphone to get better quality sound.

Run *BASND*. You are asked `EYES?` Press `ENTER` and say "eyes" into the microphone. Do the same with all five words. Next the opportunity is presented to hear the five words, one at a time (be certain that volume is not off on the television/monitor). You are asked `LISTEN AGAIN?` Pressing 'N' allows the words to be rerecorded; any other response permits the words to be heard once more.

When word clarity is acceptable, press `BREAK` and type `EXEC 49152`. Now the editor message appears. Enter `Z`. Prepare the tape recorder to record the machine language data. Enter `P FACE 4268 6978 4268`. This is the machine code which is called upon by the BASIC program to produce verbal output.

To use the program, load or type in Listing 1. Then `CLOADM` the voice machine code you have just created. Type `RUN` and marvel as the computer talks with your own voice.

My young daughter can read the words (even written on a sheet of paper by hand) and she loves to type. Exposing girls to computers early in life might close the gap of interest in computers which threatens to shut women out of many good jobs in the future. Remember that your child enjoys having you participate; the computer without a friend is just another set of toy blocks.

(Questions about this program may be directed to Mr. Rigsby at 2210 Kamino Del Mar, Sanibel, FL 33957. Please enclose an SASE when writing.) ☐

Half-pint hacker Ember Rigsby plays another round of *Face*.

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		2130	253
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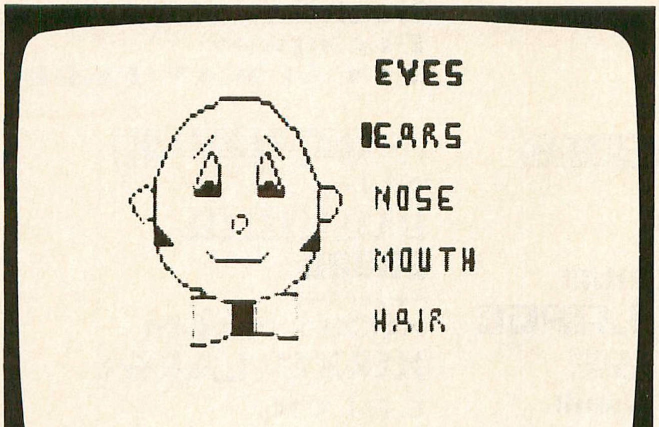
340	18	2500	23
440	217	2725	1
530	9	2810	133
800	53	2930	64
1110	85	END	89

Listing 1: FACE

```
0 GOTO 5000
1 PMODE1,1
3 SCREEN1,1
4 COLOR8,5
5 PCLS
10 A$="U2;E2;U6;R4;D6;L2;R2;F2;D
2;BM+6,0"
20 B$="U10;R6;D6;L4;R4;D4;L4;R4;
BM+6,0"
30 C$="R4;L4;U10;R4;BM+6,10"
40 D$="R2;E4;U2;H4;L2;D10;BM+12,
0"
50 E$="R6;L6;U4;R4;L4;U6;R6;BM+6
,10"
60 F$="U4;R4;L4;U6;R6;BM+6,10"
70 G$="R6;U4;L2;R2;D4;L6;U10;R6;
BM+6,10"
80 H$="U10;D6;R4;U6;D10;BM+6,0"
90 I$="U10;BM+6,10"
100 J$="U2;D2;R4;U10;L4;R8;BM+6,
10"
110 K$="U10;D4;R2;E4;G4;F4;D2;BM
+6,0"
120 L$="U10;D10;R4;BM+6,0"
130 M$="U10;F4;D2;U2;E4;D10;BM+6
,0"
140 N$="U10;F4;D2;R2;U6;D10;BM+6
,0"
150 O$="U10;R4;D10;L2;R2;BM+6,0"
160 P$="U10;R6;D6;L6;D4;BM+12,0"
170 Q$="U10;R6;D6;L2;R2;D4;L4;R6
;BM+6,0"
180 R$="U10;R4;D2;G2;F4;D2;BM+6,
0"
190 S$="R6;U4;L6;U6;R6;BM+6,10"
200 T$="BM+4,0;U10;L4;R8;BM+6,10
"
210 U$="U10;D10;R4;U10;BM+6,10"
220 V$="BM+4,0;H2;U2;H2;U4;D4;F2
;D2;F2;E2;U2;E2;U4;BM+6,10"
230 W$="U10;D10;E4;U2;D2;F4;U10;
BM+6,10"
240 X$="U2;E2;U2;H2;U2;D2;F2;E2;
U2;D2;G2;D2;F2;D2;BM+6,0"
250 Y$="BM+4,0;U4;L2;U2;H2;U2;D2
;F2;D2;R4;U2;E2;U2;BM+6,10"
260 Z$="R8;L8;U2;E2;R2;E4;U2;L8;
R8;BM+6,10"
320 A1$="BM46,36;G2;D2;G2;D2;G2;
D2;G2;D2;G2;D2;G2;D32;R10;H8;D6;
R4;L2;U2;D2;L2;D6;F2;D2;F2;D2;R2
;F8;R2;F2;R6;D2;R2;D2;R6;L14;D24
;R8;E2;R6;E2;R2;E2;U16;L6;"
330 A2$="R20;D16;L12;R24;F2;R10;
U22;L12;G2;L6;G2;BM+16,-6;E4;R2;
E2;R2;U2;E2;U2;E4;U4;R2;L10;E10;
D8;L6;R2;U2;R2;U2;R2;U26;H2;U2;H
2;U2;H2;U2;H2;U2;H2;U2;H2;U2;"
340 DRAWA1$:DRAWA2$
350 PAINT(84,126),6,8
352 PAINT(106,126),7,8
354 PAINT(64,126),7,8
360 B1$="L2;G2;H6;U2;H2;U2;E4;R2
;E2;R2;F2;BM+96,-2;R6;F4;D4;G2;D
2;G4;L4;"
370 B2$="L4;G6;U4;E2;U4;E2;U2;H2
;U8;H2;U10;R2;F2;D2;F2;D2;F4;BM+
96,0;R2;E2;U2;E2;U2;E2;U2;E2;G2;
D10;G2;D16;F2;D6;F2;D2;L4;H2;U2;
H4;"
380 B3$="G14;L4;G2;L6;U8;E2;U2;E
2;U2;R2;U2;E12;R2;E4;R2;BM+0,8;L
2;G10;D2;R6;E6;BM+96,-14;R2;F2;R
4;F12;D2;F4;D4;F2;D2;G2;L6;H4;L2
;H2;L4;H4;L2;H2;BM+0,-8;F4;R2;F4
;R4;U6;H2;L2;H2;L2;H2;L2;"
390 DRAW"BM32,78;XB5$;"
400 C1$="E6;R2;E2;R2;E2;R4;E2;;E
2;R22;F2;R4;F12;R2;F2;"
410 C2$="E28;R8;F2;L14;D2;R16;D2
;L20;D2;R24;D2;L28;D2;R32;D2;L36
;D2;R40;F14;"
420 C3$="E10;R4;U2;D2;R4;U2;D2;R
2;D2;U2;R2;U4;D4;R2;D2;U2;R2;U2;
D2;R6;U4;D6;R4;U4;D2;R4;U6;D6;R2
;D4;U4;R4;U2;D2;R4;U2;R4;F10;D2;
"
430 DRAW"BM48,34;XC5$;"
440 D6$="R14;U4;L2;D2;U2;H2;L4;G
6;U4;E2;U2;E2;U2;E2;U2;E2;U2;R2;
F2;D2;F2;D8;U8;BM+4,-4;H10;F10;B
M+14,0;E10;G10;BM+6,0;D2;G2;D14;
R2;U4;E2;R4;F6;L12;R12;U4;H2;U2;
H2;U2;H2;U2;H2;U2;L2;"
445 D7$="BM-36,18;R6;U2;L4;BM+34
,0;R4;D2;R2;L6;"
447 D1$="XD6$;XD7$;"
450 D8$="R14;U4;L2;D2;U2;H2;L4;G
6;U4;E2;U2;E2;U2;E2;U2;E2;U2;R2;
F2;D2;F2;D8;U8;BM-14,-4;E10;BM+3
0,0;F10;BM-12,0;D2;G2;D14;R2;U4;
E2;R4;F6;L12;R12;U4;H2;U2;H2;U2;
H2;U2;H2;U2;L2;"
455 D2$="XD8$;XD7$;"
460 D3$="U4;H2;U4;E2;U2;E2;R12;F
6;D4;G2;D2;L2;G2;L12;BM+6,-8;U0;
D0;BM+26,0;U2;D4;F2;D2;R2;F2;R14
;U4;E2;U4;H2;U2;H2;L12;G6;BM+12,
2;U0;D0;"
```

```
470 DRAW"BM56,66;XD5$;"
480 E1$="U4;E2;R4;F2;D2;G4;L2"
485 REM"WRITTEN BY MIKE RIGSBY,
DECEMBER 1982"
500 E2$="BM-2,0;E4;R2;F12;L26;E8
;BM+2,4;U0;BM+6,0;U0;"
510 E3$="U4;E2;R2;F2;D4;F2;R2;F2
;G2;L14;H2;E2;R2;"
520 DRAW"BM78,82;XE5$;"
530 F1$="G4;E4;R26;F4;"
540 F2$="H4;F4;R26;E4;"
550 F3$="BM+4,0;E2;R2;E2;R8;F2;R
2;F2;G2;L2;G2;L8;H2;L2;"
560 F4$="E4;R4;D2;U2;R12;F4;G2;L
6;U2;L2;D2;L12;"
570 DRAW"BM68,98;XF5$;"
580 EY$="XE$;XY$;XE$;XS$;"
590 EA$="XE$;XA$;XR$;XS$;"
600 NO$="XN$;XO$;XS$;XE$;"
610 MO$="XM$;XO$;XU$;XT$;XH$;"
620 HA$="XH$;XA$;XI$;XR$;"
625 W1$=EY$
630 W2$=EA$
640 W3$=NO$
650 W4$=MO$
660 W5$=HA$
665 CU$="U10;R2;D10;R2;U10;"
670 DRAW"BM158,12;XW1$;"
680 DRAW"BM158,42;XW2$;"
690 DRAW"BM158,72;XW3$;"
700 DRAW"BM158,102;XW4$;"
710 DRAW"BM158,132;XW5$;"
720 DRAW "BM150,12;XCU$;"
730 Q=0
740 Q1$=INKEY$
750 IF Q1$=""THEN770
760 R6=R1:GOTO 2000
770 Q=Q+1
780 IF Q=50 THEN 800
790 GOTO 740
800 COLOR5,5:DRAW"BM150,12;XCU$;
"
810 COLOR8:DRAW"BM150,42;XCU$;"
820 Q=0
830 Q1$=INKEY$
840 IFQ1$=""THEN860
850 R6=R2:GOTO 2000
860 Q=Q+1:IFQ=50 THEN 900
870 GOTO 830
900 COLOR5,5:DRAW"BM150,42;XCU$;
":COLOR8
910 DRAW"BM150,72;XCU$;"
920 Q=0
930 Q1$=INKEY$
940 IF Q1$=""THEN960
950 R6=R3:GOTO2000
960 Q=Q+1:IFQ=50 THEN 1000
970 GOTO 930
1000 COLOR5,5:DRAW"BM150,72;XCU$
;":COLOR8
1010 DRAW"BM150,102;XCU$;"
1020 Q=0
1030 Q1$=INKEY$
1040 IF Q1$=""THEN1060
1050 R6=R4:GOTO 2000
1060 Q=Q+1:IFQ=50 THEN 1100
1070 GOTO 1030
1100 COLOR5,5:DRAW"BM150,102;XCU
$;":COLOR8
1110 DRAW"BM150,132;XCU$;"
1120 Q=0
1130 Q1$=INKEY$
1140 IF Q1$=""THEN 1160
1150 R6=R5:GOTO 2000
1160 Q=Q+1:IFQ=50 THEN 1200
1170 GOTO 1130
1200 COLOR5,5:DRAW"BM150,132;XCU
$;":COLOR8
1210 GOTO 720
2000 GOTO 2001
2001 IF R6=2050 THEN 2050
2002 IF R6=2200 THEN 2200
2004 IF R6=2400 THEN 2400
2006 IF R6=2600 THEN 2600
2008 IFR6=2800THEN 2800
2010 STOP
2020 GOTO 2020
2050 B=&H42:C=&HCC:D=&H4A:E=&H38
2052 GOSUB 7000
2054 A=USR1(0)
2058 PCLS5
2060 DRAW"BM20,50;XD1$;"
2070 DRAW"BM140,50;XD2$;"
2080 DRAW"BM40,140;XD3$;"
2090 DRAW"BM25,70;XCU$;"
2100 GOSUB 6000
2110 IF SD=0 THEN 2130
2120 D5$="XD1$;"
2125 GOTO 1
2130 COLOR5:DRAW"BM25,70;XCU$;"
2135 COLOR8:DRAW"BM145,70;XCU$;"
2140 GOSUB 6000
2145 IF SD=0 THEN 2160
2150 D5$="XD2$;"
2155 GOTO 1
2160 COLOR 5:DRAW"BM145,70;XCU$;
"
2165 COLOR8:DRAW"BM45,160;XCU$;"
2175 GOSUB 6000
2180 IF SD=0 THEN 2190
2185 D5$="XD3$;"
2187 GOTO 1
2190 COLOR5:DRAW"BM45,160;XCU$;"
2195 COLOR8:GOTO2090
2200 B=&H4A:C=&H39:D=&H52:E=&H08
2202 GOSUB 7000
```

```
2204 A=USR1(0)
2208 PCLS5
2210 DRAW"BM20,50;XB1$;"
2220 DRAW"BM140,100;XB2$;"
2230 DRAW"BM40,140;XB3$;"
2240 DRAW"BM25,70;XCU$;"
2245 GOSUB6000
2250 IF SD=0 THEN2260
2255 B5$="XB1$;"
2257 GOTO 1
2260 COLOR5:DRAW"BM25,70;XCU$;"
2265 COLOR8:DRAW"BM145,120;XCU$;
"
2270 GOSUB6000
2275 IF SD=0 THEN 2290
2280 B5$="XB2$;"
2285 GOTO 1
2290 COLOR5:DRAW"BM145,120;XCU$;
"
2295 COLOR8:DRAW"BM45,160;XCU$;"
2300 GOSUB 6000
2310 IF SD=0 THEN 2330
2320 B5$="XB3$;"
2325 GOTO 1
2330 COLOR5:DRAW"BM45,160;XCU$;"
2340 COLOR8:GOTO2240
2400 B=&H52:C=&H09:D=&H59:E=&H08
2402 GOSUB 7000
```



```
2404 A=USR1(0)
2408 PCLS5
2410 DRAW"BM20,50;XE1$;"
2420 DRAW"BM140,50;XE2$;"
2430 DRAW"BM40,140;XE3$;"
2440 DRAW"BM25,70;XCU$;"
2445 GOSUB 6000
2450 IF SD=0 THEN 2470
2460 E5$="XE1$;"
2462 GOTO 1
2470 COLOR5:DRAW"BM25,70;XCU$;"
2475 COLOR8:DRAW"BM145,75;XCU$;"
2480 GOSUB 6000
2485 IF SD=0THEN 2500
2490 E5$="XE2$;"
2493 GOTO 1
2500 COLOR5:DRAW"BM145,75;XCU$;"
2510 COLOR8:DRAW"BM45,160;XCU$;"
2520 GOSUB 6000
2530 IF SD=0 THEN 2550
2540 E5$="XE3$;"
2545 GOTO 1
2550 COLOR5:DRAW"BM45,160;XCU$;"
2560 COLOR8:GOTO2440
2600 B=&H59:C=&H09:D=&H61:E=&HA8
2602 GOSUB 7000
2604 A=USR1(0)
2608 PCLS5
2610 DRAW"BM20,50;XF1$;"
2620 DRAW"BM140,50;XF2$;"
2630 DRAW"BM40,140;XF3$;"
2640 DRAW"BM140,140;XF4$;"
2650 DRAW"BM25,70;XCU$;"
2655 GOSUB6000
2660 IF SD=0THEN 2680
```

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Futura
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HAIFA

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TABLEAU
Victory
Baby Teeth Small
BABY TEETH LG.
BOBO BOLD
BOOKS
Cartwheel
Fine Print
Normande Small
Normande Medium
NORMANDE LG.
Piano
SINALOA
Sukiyaki

SET TWO

BLOCK UP
Harlow
Koloss
maharajah
MUSKEGO
Peignot Small
Peignot Large
PROGRAM SMALL
PROGRAM MEDIUM
PROGRAM LARGE
ROCK & ROLL
Futura Black Small
FUTURA BLK. LG
HANG UP
KEYBOARD
LIQUID CRYSTAL
Мосцоя Смалл
Мосцоя Ларге
ORBIT
POINT OUT
Printout Small
PRINTOUT LARGE
STOP

SET THREE

BANNER
Bocklin
Broadway
BROADWAY ENGR.
Dot Matrix

Old English
PIONEER
URBAN
Xerxes Small
XERXES MEDIUM
XERXES LARGE
celtic
HARTLAND
Script
SKYLINE
STAR KNIGHT
STENCIL
[illegible]
SUNBURST
Thin Man
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[illegible]
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You can obtain hard copies of the information and create labels of the filenames for placing on the diskette itself.

• DISK ID NAME • FILENAME/EXT • TYPE OF FILE • DATE CREATED • DATE UPDATED • NUMBER OF GRANS ALLOCATED • NUMBER OF SECTORS ALLOCATED AND USED • MACHINE LANGUAGE ADDRESSES •

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```
2670 F5$="XF1$;"
2671 GOTO 1
2680 COLOR5:DRAW"BM25,70;XCU$;"
2685 COLOR8:DRAW"BM145,70;XCU$;"
2690 GOSUB 6000
2695 IF SD=0THEN 2710
2700 F5$="XF2$;"
2705 GOTO 1
2710 COLOR5:DRAW"BM145,70;XCU$;"
2720 COLOR8:DRAW"BM45,160;XCU$;"
2725 GOSUB 6000
2730 IF SD=0 THEN 2750
2735 F5$="XF3$;"
2740 GOTO 1
2750 COLOR5:DRAW"BM45,160;XCU$;"
2755 COLOR8:DRAW"BM145,160;XCU$;
"
2760 GOSUB 6000
2765 IF SD=0 THEN 2780
2770 F5$="XF4$;"
2775 GOTO 1
2780 COLOR5:DRAW"BM145,160;XCU$;
"
2785 COLOR8: GOTO 2650
2800 B=&H61:C=&HA9:D=&H69:E=&H78
2802 GOSUB 7000
2804 A=USR1(0)
2808 PCLS5
2810 DRAW"BM20,50;XC1$;"
2820 DRAW"BM140,50;XC2$;"
2830 DRAW"BM40,140;XC3$;"
2840 DRAW"BM25,70;XCU$;"
2845 GOSUB 6000
2850 IF SD=0 THEN 2870
2855 C5$="XC1$;"
2860 GOTO 1
2870 COLOR5:DRAW"BM25,70;XCU$;"
2875 COLOR8:DRAW"BM145,70;XCU$;"
2880 GOSUB 6000
2885 IF SD=0THEN 2900
2890 C5$="XC2$;"
2895 GOTO 1
2900 COLOR5:DRAW"BM145,70;XCU$;"
2905 COLOR8:DRAW"BM45,160;XCU$;"
2910 GOSUB 6000
2915 IFSD=0 THEN 2930
2920 C5$="XC3$;"
2925 GOTO 1
2930 COLOR 5:DRAW"BM45,160;XCU$;
"
2940 COLOR8:GOTO 2840
5000 R1=2050:R2=2200:R3=2400:R4=
2600:R5=2800
5001 DEFUSR1=17032
5005 PCLS
5010 B5$="XB1$;"
5012 C5$="XC1$;"
5014 D5$="XD2$;"
5016 E5$="XE1$;"
5018 F5$="XF2$;"
5020 GOTO 1
6000 Q=0
6010 L9$=INKEY$
6020 IF L9$=""THEN6040
6030 SD=1
6032 SOUND175,3
6035 RETURN
6040 Q=Q+1
6050 IF Q=50 THEN 6080
6060 GOTO 6010
6080 SD=0
6090 RETURN
7000 POKE&H429E,B
7010 POKE&H429F,C
7020 POKE&H42B2,D
7030 POKE&H42B3,E
7040 RETURN
```

Listing 2: BASND

```
10 CLEAR200,17000
20 DEFUSR0=17000
30 DEFUSR1=17032
32 B=&H42:C=&HCC:D=&H4A:E=&H38
34 GOSUB 500
40 INPUT"EYES";B$
```

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```
50 A=USR0(0)
60 B=&H4A:C=&H39:D=&H52:E=&H08
70 GOSUB 500
80 INPUT"EARS";B$
90 A=USR0(0)
100 B=&H52:C=&H09:D=&H59:E=&H08
110 GOSUB 500
120 INPUT"NOSE";B$
130 A=USR0(0)
140 B=&H59:C=&H09:D=&H61:E=&HA8
150 GOSUB 500
160 INPUT"MOUTH";B$
165 A=USR0(0)
170 B=&H61:C=&HA9:D=&H69:E=&H78
180 GOSUB 500
190 INPUT"HAIR";B$
200 A=USR0(0)
210 B=&H42:C=&HCC:D=&H4A:E=&H38
220 GOSUB 600
230 INPUT"HEAR EYES";B$
240 A=USR1(0)
250 B=&H4A:C=&H39:D=&H52:E=&H08
260 GOSUB 600
270 INPUT"HEAR EARS";B$
280 A=USR1(0)
290 B=&H52:C=&H09:D=&H59:E=&H08
300 GOSUB 600
310 INPUT"HEAR NOSE";B$
315 A=USR1(0)
320 B=&H59:C=&H09:D=&H61:E=&HA8
330 GOSUB 600
340 INPUT"HEAR MOUTH";B$
345 A=USR1(0)
350 B=&H61:C=&HA9:D=&H69:E=&H78
360 GOSUB 600
370 INPUT"HEAR HAIR";B$
375 A=USR1(0)
380 INPUT"LISTEN AGAIN";B$
390 IF B$="N" THEN 10
400 GOTO 210
500 POKE &H426E,B
510 POKE &H426F,C
520 POKE &H4283,D
530 POKE &H4284,E
540 RETURN
600 POKE &H429E,B
610 POKE &H429F,C
620 POKE &H42B2,D
630 POKE &H42B3,E
640 RETURN
```

Listing 3: SOUND

```
4268               00090          ORG     17000
4268 1A      50    00100 RECORD   ORCC    #$50
426A CE      FF20  00110          LDU     #$FF20
426D 8E      42CC  00120          LDX     #17100
4270 86      01    00130          LDA     #$01
4272 5F            00140 HIGH     CLRB
4273 5C            00150 HLOOP    INCB
4274 A5      C4    00160          BITA    ,U
4276 26      FB    00170          BNE     HLOOP
4278 E7      80    00180          STB     ,X+
427A 5F            00190          CLRB
427B 5C            00200 LOW      INCB
427C A5      C4    00210          BITA    ,U
427E 27      FB    00220          BEQ     LOW
4280 E7      80    00230          STB     ,X+
4282 8C      4A38  00240          CMPX    #19000
4285 25      EB    00250          BLO     HIGH
4287 39            00255          RTS
4288 1A      50    00260 PLAY     ORCC    #$50
428A CE      FF20  00270          LDU     #$FF20
428D 6F      43    00280          CLR     3,U
428F CC      F83C  00290          LDD     #$F83C
4292 A7      42    00300          STA     2,U
4294 E7      43    00310          STB     3,U
4296 CC      B435  00320          LDD     #$B435
4299 A7      5D    00330          STA     -3,U
429B E7      5F    00340          STB     -1,U
429D 8E      42CC  00350          LDX     #17100
42A0 86      60    00360 HIOUT    LDA     #$60
42A2 E6      80    00370          LDB     ,X+
42A4 A7      C4    00380 HILOOP   STA     ,U
42A6 5A            00390          DECB
42A7 26      FB    00400          BNE     HILOOP
42A9 4F            00410          CLRA
42AA E6      80    00420          LDB     ,X+
42AC A7      C4    00430 LOLOOP   STA     ,U
42AE 5A            00440          DECB
42AF 26      FB    00450          BNE     LOLOOP
42B1 8C      4A38  00460          CMPX    #19000
42B4 25      EA    00470          BLO     HIOUT
42B6 39            00480          RTS
MISSING END
```

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Updating the Color Change Quiz

By Fred B. Scerbo
Rainbow Contributing Editor

Editor's Note: If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. *Remember, keep your ideas specific, and don't forget that this is* BASIC. *All programs resulting from your wishes are for your use but remain the property of the author.*

September brings our annual education issue and the advent of another school year, so what better time for us to update and enhance one of our more popular "Wishing Well" programs, the *Color Change Quiz*. Therefore, this month you will find listed a new, advanced sequel to that highly popular offering which picks up where the first program left off. To achieve this, we will generate graphic representations of the more commonly used paper bills and present them in a format the user can easily identify.

Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.

The Wish: More of the Same

When *Color Change Quiz* was first listed in the pages of the "Wishing Well," I received a great deal of mail from parents and teachers who found it to be a useful addition to their educational software collection. The program drew very recognizable images of a quarter, dime, nickel and penny, right down to George Washington and Thomas Jefferson's ponytails. While the program was only a quiz, and not an example of CAI (Computer Aided Instruction), it could serve as instruction since repetition of the use of money in and of itself can be educational.

I had limited the display to the coins mentioned for two reasons. First, they are the most commonly used coins. Neither half dollars nor silver dollars are in great circulation. Secondly, limited screen space does not allow for display of larger coins, or, as I felt at the time, currency. I was also reluctant to try to generate a green color in PMODE4.

Color Change Quiz II was designed to display up to 15 of these coins on the screen at one time. The program easily fits into 16K Extended BASIC. My own students used this program extensively, but as is the case with all instructional materials, the need for more difficult and advanced material increased the more they used the program. Taking the comments I received from parents and teachers into consideration, I decided that now was the time to make a second generation of the *Color Change Quiz*. The task, however, was not as simple as I hoped.

Making the Program

The first problem I had to overcome in making *Color Change Quiz II* was finding a way to display paper currency without either reducing the size of the graphics or filling up the whole screen with just a few bills. I solved this problem by using the same scale I used for the coins from the first program, and only displaying the left-hand quarter of any given bill. This created the image of a folded bill, which is not that uncommon. Once I had designed the frame for the one dollar bill, superimposing a five and a 10 in the frame was not that difficult.

Part of the problem I had to deal with was finding a way to display the green color for the bills. After taking a close look at some bills, I came to the conclusion that our currency is really not that green after all. It is closer to an olive

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shade. Therefore, it was just as easy to draw the bills in blue. Once you see the graphics display on the screen, I think you will agree that it is attractive enough and close enough to the actual appearance so as not to cause any confusion.

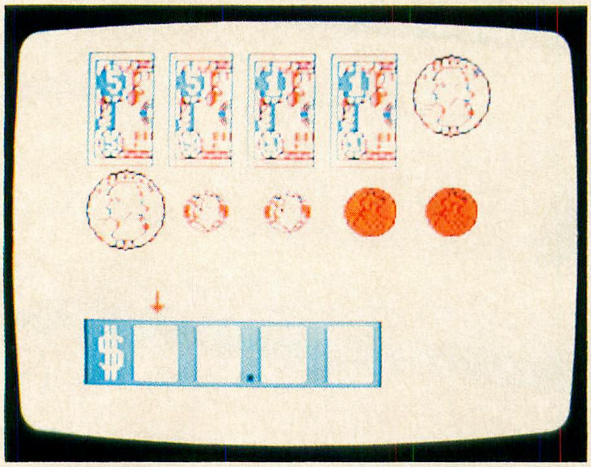
The next problem was one of memory. Each bill would have to take up much more graphics array memory than the coins in the original program. Since the program had to include these coins as well as the bills, the program soon became too large to fit into a 16K machine. (It was written on a 64K CoCo.) To get around this problem it became necessary to redesign the GET and PUT statements for the coins in the original program.

The original program had the size of each coin array the same. Therefore, the box holding the graphics of a dime included the surrounding white space and was just as large as the array holding the much larger image of a quarter. This memory was naturally wasted. It was easier to write the original program with identical sized arrays, since the variables for each would be the same. Once we got to the memory crunch, however, I had to reduce each of these arrays to the smallest size box, and adjust the variables in each PUT statement to correspond to this. With a little work, the task was accomplished and a sizeable chunk of memory was free for other use.

I was also able to free some additional memory by reducing the CLEAR statement to the smallest amount of string space needed. This is accomplished by reducing the CLEAR value to the smallest possible value until you get an ?OS Error (out of string space). Pulling back to a larger value gives just what you need.

The screen display also had to be redesigned to fit the new graphics and dollar amounts. The score box was changed to four digits ($XX.XX) and the size of the word correct was reduced to allow it to fit next to the now larger answer box. The size of the bills also required that only ten coins or bills could be displayed at one time, as opposed to the maximum of 15 on the original program. This is acceptable, since we are dealing with larger dollar amounts by using bills and it remains consistent with the increasing difficulty level from the first program.

With a few adjustments to the title card and a redesign of the score card to make it consistent with our Life Skills series, the program was finally crunched down small enough to fit into 16K.



Some of you may be wondering why this program was not included in our Life Skills series. First, I wanted the program to appear as a logical successor to *Color Change Quiz*. Retaining the title card would allow this program to go hand in hand with the original. It does not replace the original; it is just the next logical step after mastering it. Secondly, the programs in the Life Skills series are designed to work in Color BASIC without the Extended commands as well as in MC-10 Color BASIC. The use of graphics makes the program unworkable on those two machines.

The last feature I wanted to include was the use of CPL, or Computer Paced Learning, which I introduced in last month's "Wishing Well." If the user gets a score of 95 or greater after 10 problems or after checking the score, the difficulty level increases. If the user gets below a 70, the level decreases. Therefore, the program keeps advancing with the student as his or her skill increases.

Using the Program

Upon running the program, the screen displays the title card. You are asked to select the number of units (coins and bills) you want to have displayed up to a maximum of 10. The screen then clears and asks you to select the red-colored letter, either 'A' or 'B'. This gives us the correct color set to ensure red pennies and blue bills without having to press the Reset button.

> ***". . . our currency is really not that green after all."***

The screen next displays a random selection of coins and bills. Sometimes the screen displays all of one kind of coin or bill with the exception of 10 dollar bills. The screen is not designed to take an answer larger than $99.99 as an input. If the user makes a mistake prior to pressing a number for the last digit, the backspace arrow can be used to correct and clear the answer box. Once the last digit is pressed, however, the answer is taken.

If the answer is correct, the screen prints CORRECT. Unlike the original program, it does not proceed directly to the next problem. The user must press ENTER to move on to the next problem. Pressing the '@' key during a problem presents the score card. You may not press '@' while the word "correct" is on the screen. You must proceed to the next screen and then press '@'.

After seeing the score, you may press 'Y' to rerun the program, 'N' to exit the program and 'C' to continue where you left off. Therefore, you can monitor a student's progress, yet continue without restarting the program. The original *Change Quiz* did not allow this.

Conclusion

Some of you wrote saying you could not get *Color Change Quiz* to work. (There were no errors in the listing and it is not possible for me to debug your programs, even with an SASE. There just isn't enough time.) This program has been run and run again to make sure it is bug free. If you have any problems, recheck it line for line or get a RAINBOW ON TAPE.

I hope this program becomes a useful addition to your software library.

See you next month. ☐

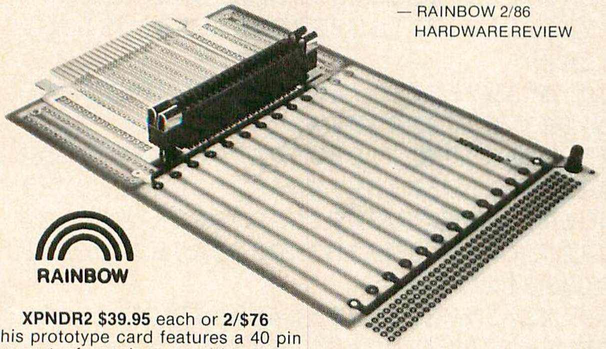
50	27
90	253
150	149
175	158
210	133
270	105
375	20
435	164
END	54

The listing: CHNGQUIZ

```
1 '*****************************
2 '*   COLOR CHANGE QUIZ II  *
3 '*    BY FRED B. SCERBO    *
4 '*   COPYRIGHT  (C) 1986    *
5 '* 60 HARDING AVE.N.ADAMS,MA*
6 '*****************************
10 CLEAR150:CLS0:FORI=0TO64STEP3
2:FORY=1062TO1080:READA:POKEI+Y,
A+128:NEXTY,I
15 FORI=0TO64STEP32:FORY=1156TO1
179:READA:POKEI+Y,A+128:NEXTY,I:
FORI=0TO64STEP32:FORY=1253TO1267
:READA:POKEI+Y,A+128:NEXTY,I
20 FORI=46TO49STEP3:FORY=14TO18:
SET(I,Y,7):NEXTY,I:FORY=14TO18ST
EP4:FORI=45TO50:SET(I,Y,7):NEXTI
,Y
25 DATA63,60,60,,63,60,63,,63,48
,48,,63,60,63,,63,60,63
30 DATA127,112,112,,127,112,127,
,127,112,112,,127,112,127,,127,1
25,114
35 DATA44,44,44,,44,44,44,,44,44
,44,,44,44,44,,44,32,44
40 DATA95,92,92,,95,80,95,,87,92
,91,,95,91,80,95,,95,92,92,,95,9
2,92
45 DATA95,80,80,,95,92,95,,95,92
,95,,95,84,91,95,,95,84,95,,95,9
2,92
50 DATA92,92,92,,92,80,92,,92,80
,92,,92,80,84,92,,92,92,92,,92,9
2,92
55 DATA47,44,47,,47,32,47,,36,47
,40,,44,44,47
60 DATA47,33,47,,47,32,47,,32,47
,32,,35,44,32
65 DATA44,44,46,,44,44,44,,36,44
,40,,44,44,44
70 DIMD(18),P(23),N(34),Q(55),A(
8),CV(7),TV(10),N$(9),CS(15),PS(
15),DB(62),FD(62),TD(62)
75 DATA BL2L3H2U7E2R3F2D7G2,BLL6
R3U11LGD,NU2L7U3E2R3E2U2H2L3G2D2
,BH4BL3D2F2R3E2U3H2NL2EU2HL3GD,L
3R2U11LG5D2R8,BL7BU2F2R3E2U3H2L3
G2U6R7D2,BU10BLHL3G2D7F2R3E2U3H2
L3G2,BL6E6U5L7D3,BU2G2L3H2U3E2HU
2ER3FD2GNL3F2D3,BL5NHR3E2U7H2L3G
2D3F2R3E2
80 FORI=0TO9:READN$(I):NEXT:JK(1
)=1000:JK(2)=100:JK(3)=10:JK(4)=
1
85 R=5:PRINT@352,"          BY FRED
 B. SCERBO":PRINT"         COPYRIGH
T (C)  1986"
90 PRINT@416," ENTER NUMBER OF U
NITS (MAX.10)":PRINT:PRINT@460,"
";:INPUTQW:IFQW>10THEN90ELSEIFQW
=0THEN90
95 T=1:IFQW>5THENDL=2
100 PMODE4,1:PCLS1:SCREEN1,1
105 CV(1)=1:CV(2)=5:CV(3)=10:CV(
4)=25:CV(5)=100:CV(6)=500:CV(7)=
1000
110 PMODE3:FORI=1TO3:DRAW"S16BM"
+STR$(I+84)+",136C7U3NR4U2END6R2
ND6FD5BR12C6U6RND6R2FDGNL2RFDGL3
":NEXTI
115 DRAW"S12BM36,50C1U6R3FDGNL3B
D3BR3U6R3FDGL3R2F2DBR3NR3U3NR2U3
R3BR3BD6R3U3L3U3R3BR3BD6R3U3L3U3
R3BR2"
120 DRAW"BD6BR16U6L2R4BR3D6U3R4U
3D6BR3NR3U3NR2U3R3"
125 DRAW"BM27,88U6R3FDGL3R2F2DBR
3NR3U3NR2U3R3BR3ND6R2F2D2G2L2BR1
8NU6R3BR3NR3U3NR2U3R3BR3R2ND6R2B
R3R2ND6R2BR3NR3D3NR2D3R3BR3U6R3F
DGL3R2F2D"
130 X$=INKEY$:IFX$="A"THEN135ELS
EIFX$="B"THEN140ELSE130
135 L=7:B=2:GOTO145
140 L=6:B=3
145 CLS0:PMODE4,1:PCLS1:SCREEN0,
1:CIRCLE(40,40),14,0,.9:DRAW"S4C
0BM48,44NG5U3EU4HULH2L2HL5GLGDGD
2FG2DRD2NR3D2FR2FRFDRFRBU6GLREBU
2REU2HL2BL3BDNL2NGHLHLBU4R4BFGBG
F"
150 CIRCLE(40,40),12,0,.9,.4,.2:
GET(26,28)-(54,52),D,G:PCLS1:CIR
CLE(80,40),16,0,.9:PAINT(80,40),
0,0:PMODE3:PAINT(80,40),L,8:PMOD
E4:CIRCLE(80,40),16,0,.9:CIRCLE(
81,40),16,0,.9,.6,.3
155 LINE(60,26)-(100,54),PSET,B:
CIRCLE(80,40),14,0,.9,.15,.4:CIR
CLE(80,40),14,0,.9,.65,.9
160 FORI=70TO71:DRAW"C0BM"+STR$(
I)+",46UE3UBRNF2BLUE2UHU2HR2E2UR
BRR2FRFRDR2D2G4F2DRBL4F6BL4NH3BL
4NH4BU11U2R3BD2DBD5BR4NR4BL8BU4L
3NU2BL3BD2L5":NEXT:GET(64,26)-(9
6,54),P,G
165 FORI=0TO1:CIRCLE(135,40),20+
I,0,.8:NEXTI:COLOR1,0:LINE(110,2
4)-(160,56),PSET,B:FORI=17TO19ST
EP2:CIRCLE(135,40),I,0,.8,.4,.7:
CIRCLE(135,40),I,0,.8,.9,.1:NEXT
170 DRAW"C0BM125,52U2ENR3U2E3R3E
R6FD2FD2FD2BR3U2HU2HU2NL4U3L3D3R
3U3E2UEUHU2HU2HLHL12GLGD2NR3GDNF
2FDG2DNR3R2DGDNR3GF2R2":FORI=2TO
6STEP4:CIRCLE(136,34),I,0,1.3,.2
,.5:NEXT:CIRCLE(138,50),6,0,.7,.
5,.8
175 GET(115,24)-(156,56),N,G:FOR
I=20TO22:CIRCLE(200,40),I,0,.9,.
6,.9:CIRCLE(200,40),I,0,.9,.2,.3
:NEXTI:COLOR1,0:FORI=180TO210STE
P5:LINE(I,20)-(I+2,90),PSET,BF:N
EXTI
180 FORI=0TO1:CIRCLE(200,40),24+
I,0,.9:NEXT:CIRCLE(200,40),19,0,
.9,.15,.35:DRAW"C0BM212,52U2LU2H
2U2H2R2F3D2RD3BL4BU8R2E2U2HL2HL2
H2L2GDBR8U3HU2H2UHUL11GLGLDLD2LD
LDBRF2BDG3DR3LD2NR2D2F2R2FD3G3DG
BR8BU9NE4BL11BD2L4BH2R7BR7BU10H2
NLBD2D"
185 GET(176,18)-(224,62),Q,G:PMO
DE4,1:PCLS1
190 LINE(0,0)-(40,60),PRESET,B:L
INE(4,4)-(40,56),PRESET,B
195 CIRCLE(14,16),9,0,1.3:CIRCLE
(14,48),8,0,1.1
200 DRAW"BM40,8C0L10U2H2L2D2LD2L
2ND2R2F4NU4E2RD4G4LNU8R4F2D2L2H4
F2D6G2NU9LH2U4NE4G4L4D14L2U14G6U
4E2RD4U2H4D10R4E3D4G2L2H2L2D6E2R
4D2BM40,52L20F4E4F4E4F4L2H4G4H4G
4"
205 DRAW"BM40,8H4G4H4R2F4E4":PMO
DE3:CIRCLE(14,16),8,B,1.3:PAINT(
14,16),B,B:CIRCLE(14,48),7,B,1.1
:PAINT(14,48),B,B
210 DRAW"BM16,10D10R2DL6UR2U8G2B
D32E2D6RNR2L2":PMODE4:FORI=0TO4S
TEP2:CIRCLE(40,32),9-I,0,.9,.25,
.75:NEXT
215 DRAW"C0BR16U2BU2U4NR2D2NR2D2
R2BR4U4BR4D4BU32BL2U4L2R4":GET(0
,0)-(40,60),DB,G
220 PMODE3:CIRCLE(14,16),8,B,1.3
:PAINT(14,16),B,B:CIRCLE(14,48),
7,B,1.1:PAINT(14,48),B,B
225 DRAW"BM12,10NR6DNR6D3NR4DR4F
2D2G2L2H2BD26NR4D2R2F2DGLH":GET(
0,0)-(40,60),FD,G
230 COLORB,B:LINE(5,6)-(24,24),P
RESET,BF:LINE(6,44)-(24,52),PRES
ET,BF
235 DRAW"BM6,50C4U4NL2R2BR2NR2D2
NR2D2R2BR4U4F4R2U4BU24BL4L2H2U10
E2R2F2D10G2BL8L4UR2U12NG2ED13R2"
:GET(0,0)-(40,60),TD,G
240 PMODE4,1:PCLS5:SCREEN1,1
245 KC=0:PMODE3
250 HL=RND(32):IFHL<=27THEN265
255 IFQW=1THENCS(1)=RND(7):GOTO2
70
260 FOR RT=1TOQW:CS(RT)=HL-26:NE
XTRT:GOTO270
265 CS(1)=RND(3)+4:FOR RT=2TOQW:
CS(RT)=RND(7)::NEXTRT
270 SR=0
275 FOR RT=1TOQW-1:IFCS(RT)<CS(R
T+1)THEN285
280 NEXT RT:IFSR=1THEN270ELSE290
285 TEM=CS(RT):CS(RT)=CS(RT+1):C
```

"XPNDR2 and SuperGuide - an Ideal Expansion Card Set"

— RAINBOW 2/86
HARDWARE REVIEW



RAINBOW

XPNDR2 $39.95 each or **2/$76**
This prototype card features a 40 pin connector for projects requiring an on-line disk system or ROM paks. The CoCo signals are brought out to wire-wrap pins. Special gold plated spring clips provide reliable and noisefree disk operation plus solid support for vertical mounting of the controller. The entire 4.3×7 inch card is drilled for ICs. Assembled, tested and ready to run.

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Here is a unique plastic insert that aligns and supports printed circuit cards in the CoCo cartridge port. Don't forget to **ORDER ONE FOR YOUR XPNDR CARDS**.

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```
S(RT+1)=TEM:SR=1:GOTO280
290 D=0:JC=0:FORY=1TO DL:C=2:FOR
I=T TO R:JC=JC+1
295 F=CS(JC)
300 TV=TV+CV(F):KC=KC+1
305 ON F GOTO310,315,320,325,330
,335,340
310 PUT(C+8,D+8)-(C+40,D+36),P,P
SET:GOTO345
315 PUT(C+4,D+6)-(C+45,D+38),N,P
SET:GOTO345
320 PUT(C+10,D+10)-(C+38,D+34),D
,PSET:GOTO345
325 PUT(C,D)-(C+48,D+44),Q,PSET:
GOTO345
330 PUT(C,D)-(C+40,D+60),DB,PSET
:GOTO345
335 PUT(C,D)-(C+40,D+60),FD,PSET
:GOTO345
340 PUT(C,D)-(C+40,D+60),TD,PSET
345 C=C+50:IF KC=QW THEN360
350 NEXTI
355 D=D+62:NEXTY
360 COLOR8,6:LINE(0,144)-(182,18
2),PRESET,BF
365 FORK=0TO120STEP40:LINE(32+K,
148)-(56+K,178),PSET,BF:NEXTK
370 DRAW"C5S4BM102,178U3R2D3"
375 COLOR7,5:LINE(0,144)-(182,18
2),PRESET,B
380 DRAW"S8BM10,170C8FRND3NU12R2
ND3NU12REU3HL5U3ER4F"
385 PV=1:FORK=0TO120STEP40:DRAW"
BM"+STR$(K+44)+",140C7NU6NH2E2L3
"
390 X$=INKEY$:IFX$=CHR$(8)THEN44
0ELSEIFX$="@"THEN455ELSEIFX$=""T
HEN390
395 KP=ASC(X$):IFKP<48THEN390ELS
EIFKP>57THEN390
400 KP=KP-48:DRAW"BM"+STR$(K+51)
+",174C7"+N$(KP)+"BM"+STR$(K+44)
+",140C8NU6NH2E2L3"
405 AV=AV+KP*(JK(PV)):PV=PV+1:NE
XTK
410 IF AV<>TV THEN435
415 NR=NR+1:DRAW"S8BM189,168C7HU
3ERFBD3GNLBR4HU3ERFD3GNLBR4U5R2F
DGNL2FDBR2U5R2FDGNL2FDBR2U5NR3D2
NR3D3R3BR3HU3ERFBD3GNLBR4U5L2R4"
:SOUND200,4
420 FORP=1TO300:NEXTP
425 CL=CL+1:IFCL<10THEN445
430 CL=0:GOSUB470:GOTO445
435 NW=NW+1:FOR BQ=1TO3:PMODE4:S
CREEN1,0:SOUND19,5:SCREEN1,1:SOU
ND1,5:PMODE3:NEXT BQ:AV=0:KP=0:G
OTO360
440 DRAW"BM"+STR$(K+44)+",140C4N
U6NH2E2L3":AV=0:KP=0:GOTO360
445 X$=INKEY$:IFX$<>CHR$(13)THEN
445
450 AV=0:C=0:D=0:TV=0:GOTO240
455 CLS:PRINT@101,"YOU TRIED"NR+
NW"PROBLEMS &":PRINT@165,"ANSWER
ED"NR"CORRECTLY"
460 PRINT@229,"WHILE DOING"NW"WR
ONG."
465 GOSUB470:GOTO510
470 NQ=NR+NW:IFNQ=0THEN NQ=1
475 MS=INT(NR/NQ*100)
480 IFMS<70THENQW=QW-1
485 IFQW<1THENQW=1
490 IFMS>95THENQW=QW+1
495 IFQW>10THENQW=10
500 IFQW>5THENDL=2ELSEDL=1
505 RETURN
510 PRINT@293,"YOUR SCORE IS"MS"
%."
515 PRINT@357,"ANOTHER TRY (Y/N/
C) ?";
520 X$=INKEY$:IFX$="Y"THENRUN
525 IFX$="N"THENCLS:END
530 IFX$="C"THEN450
535 GOTO520
```

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PIPELINE

DRIVE IT! Derby City Software & Microtechnologies has announced the start of production for two new Color Computer hardware devices. The first device is a monitor driver available in three configurations. The V.D.1 is designed to drive a color or monochrome monitor with sound capability. The V.D.2 can be used for monitors without sound and the V.D.3 will drive both a color and a monochrome monitor simultaneously. These drivers, which retail for $28.95, include instructions and require no soldering for installation.

The second device is a DOS switcher for older J & M disk controllers. The switcher is jumper selectable for any combination of 24- or 28-pin EPROMs. No soldering is required for installation, and the switcher has all gold contacts. The DOS switcher retails for $34.95. *Contact Derby City Software & Microtechnologies, 3025 Kozy Kreek Drive, Louisville, KY 40220-2567, (502) 459-2626.*

SWITCH IT! Telebyte Technology, Inc. is offering a solution to the problem of data routing between multiple peripherals. Operator routing between a single source and two output devices, or from two sources to one output can be accomplished with the new Model 312 and Model RS-313. The Model 312 is intended for use with RS-232 ports utilizing DB-25 connectors, while the Model RS-313 is designed to be used with Centronics-type ports. Port selection is made using large push buttons marked 'A' and 'B'. Neither unit requires power and each retails for $79.95. *Contact Telebyte Technology, Inc., 270 East Pulaski Road, Greenlawn, NY 11740, or call (800) 835-3298 or in New York state, (516) 423-3232.*

LITERATURE Two new publications being offered by Howard W. Sams & Company are *Printer Connections Bible* and *Modem Connections Bible.*

With the many different computers, printers and cables presently on the market, making a printer-computer connection can be frustrating. The *Printer Connections Bible* contains the information necessary to make proper hardware connections. The book focuses on the main interface — the cable itself. Also included are several tables and diagrams plus information on various computers and printers. The companion book, *Modem Connections Bible*, is intended for those who want to connect a computer to a modem, interconnect several modems or just want to know more about modems. The heart of the book is a collection of drawings of the RS-232-C interfaces on a number of popular microcomputers, the interfaces on the modems and the cables that connect the two. The books retail for $16.95 each. *Contact Howard W. Sams & Co., Dept. R44, 4300 W. 62nd Street, Indianapolis, IN 46268, (317) 298-5723.*

COLORFUL PRINTS C. Itoh Digital Products, Inc. has introduced a seven-color version of its popular 80-column ProWriter C-310 and its wide-carriage ProWriter C-315 dot-matrix printers. The letter-quality printers are designed to handle any home, business or office printing task, and now produce color graphics up to 240 by 216 dots per inch. Both printers print at speeds up to 300 cps in draft mode, 50 cps in the near-letter-quality mode and 33 cps in the letter-quality mode. The printers also come with a variety of resident character fonts and optional font cartridges. Retail price for the color C-310 is $739 and the price for the color C-315 is $909. *Contact C. Itoh Digital Products, Inc., 19750 South Vermont Avenue, Suite 220, Torrance, CA 90502, (213) 327-2110.*

FREE CATALOG A free catalog of educational software for home and school is available from Creative Technical Consultants, a leading developer of educational software for the Color Computer for over four years. The catalog features new programs introduced for the 1986/1987 school year, as well as improved versions of programs from previous years. The programs range from educational games for K-6 to study aids for high school and college, and are available in both tape and disk versions. *Contact CTC, P.O. Box 652, Cedar Crest, NM 87008.*

SAVE YOUR MODEM'S LIFE Electronics Specialists, Inc. now produces protection for your modem. Model PDS-11/SUP is intended to suppress damaging telephone and power line spikes caused by lightning, spherics or office phone switch gear. It offers suppression on the red and green lines while allowing the yellow and black to run straight through. A 6500 amp suppressor protects the AC power line, while MOVs and Gas Discharge Tube suppression techniques are used for overall protection. Price for the PDS-11/SUP is $109.05. *Contact Electronic Specialists, Inc., 171 S. Main Street, P.O. Box 389, Natick, MA 01760, (800) 225-4876.*

CLEAN 'ER UP! Philips ECG, Inc. has recently added a computer care kit to its Hi-Tech Chemical line. This complete kit, which retails for $39.95, includes a floppy disk head cleaner, magnetic tape/head and disk spray, antistatic spray, Jet Air cleaner, screen wipes, lint-free wipes and swabs plus complete instructions. The kit allows you to maintain your system for years of reliable service. *Contact Philips ECG, Inc., P.O. Box 3277, Williamsport, PA 17701, (800) 233-8767 (in Pennsylvania, 800-222-9308).*

AGAIN WITH SWITCHING? Ohm/Electronics has announced the availability of their new family of slimline Scooter(R) Data Switches. Only two inches high, these switches allow you to put any of two or three compatible peripherals online by pushing a button. The data switches require no power and are available with either two or three switch connections, in either serial or parallel operation. Model AB25 (serial) and Model AB36 (parallel) offer two device controls, while Model ABC25 and Model ABC36 will switch among three devices. Suggested retail prices are: Model AB25, $79; Model AB36, $85; Model ABC25, $84; Model ABC36, $96. *Contact Scooter Products, Ohm/Electronics, Inc., 746 Vermont Street, Palatine, IL 60067, (800) 323-2727 (in Illinois 312-359-6040).*

THE SUPER NEWS!

SUPER RAM -

The first 256K/512K memory board for the CoCo II ! 256K/512K of memory resides in this sturdy, low noise metal case and all the support circuitry to access it as a high speed RAMDISK! Compatible with all CoCo II's, even the 26-3127B and 26-3134A/B. (see June '86 Rainbow Review) Requires a RS Multi-Pak.

256K Board - $129.95 512K Board (Recommended for OS-9 users) - $169.95
OS-9 Driver - $24.95

SUPERCOMP -

NOW add 68008 CPU processing power to the CoCo ! Simply plug the 68K board into the Rompak port of your CoCo and attach your Disk Controller into the 68K board. Features 8/16/32 bit internal processing, parallel port, and fast DMA operation.

256K Board - $349.95 (Metal case $39.95) 256K RAMDISK Driver - $59.95
OS-9 Driver - $29.95

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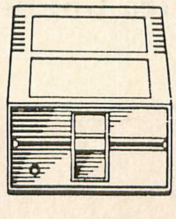

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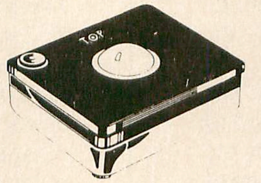

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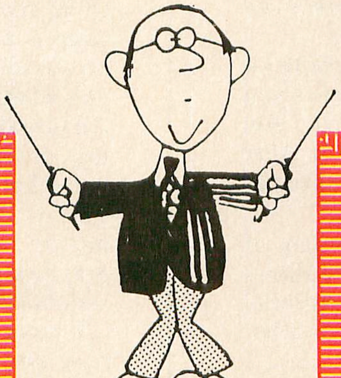

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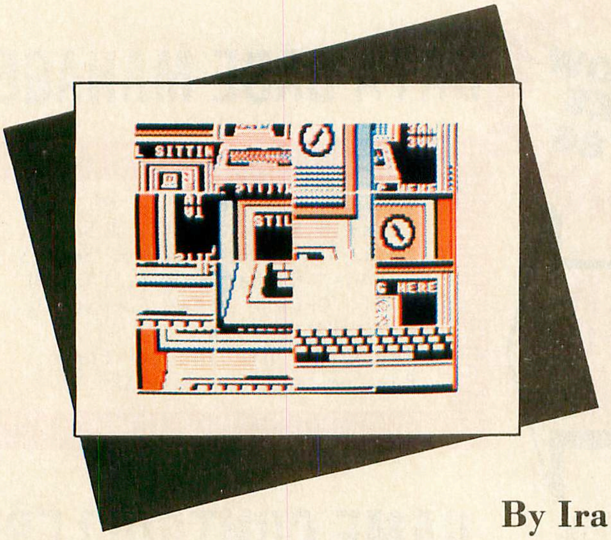

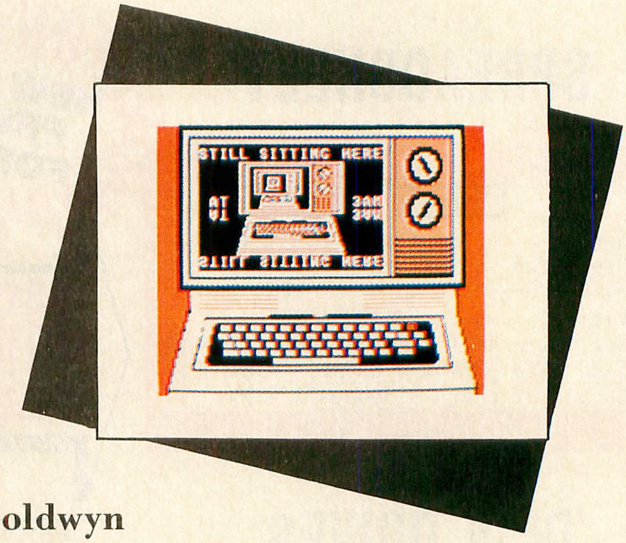

By Ira Goldwyn

There have been several attempts to simulate the seemingly childish game where a picture is divided into 16 boxes, scrambled and must be reassembled. Each attempt has had two problems: They were limited to simple `DRAW` pictures embedded in the program, and the random scrambling of the screen often caused the puzzle to be unsolvable.

I have found a solution to both of these problems. *Scrambled Pix* lets you use any saved screen in the puzzle. You can use any 6K picture. *CoCo Max* pictures can be used if they are saved as a single screen.

The scrambling at the beginning of the program is random, but only allows for legal moves. It is done quickly because no `DRAW`, `LINE`, `PAINT` or other graphics drawing statements are used. The picture is manipulated by `PUT` and `GET` statements.

A unique feature is the ST$ array. For each of the sixteen boxes, I encoded the boxes that were legal to be moved. The computer simply checks the "box to be moved from" code and checks if "box to be moved to" is legal. The arrows control the action. Simply press the arrow to tell the computer which box you want to move into the empty box. An illegal move gives a beep. If you are lost, press the space bar and it will show you what the picture should look like. This is done by having the original picture copied to the upper pages of graphics memory before the picture is scrambled.

I have had a good time with this program; it's not as easy as it seems. Have fun!

Ira Goldwyn is the graphics master of his users group. He lives in Great Neck, New York and is currently enrolled in a master's program and hopes to soon be an English teacher.

(You may direct questions about this program to Mr. Goldwyn at 12 Tain Drive, Great Neck, NY 11021, 516-482-3049. Please enclose an SASE when writing.) ☐

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```
100 ......247
240 .......96
530 ......162
1010 .....154
END .....239
```

The listing: SCRAMBLE

```
10 CLS:PCLEAR8:DIM A(32,24),ST$(16):B=16:A=16:GOSUB510
20 INPUT"PICTURE FOR PUZZLE";F$
30 INPUT"DRIVE";D$
40 F$=F$+":"+D$
50 LOADM F$
51 LINE(0,0)-(255,5),PRESET,BF:LINE(0,186)-(255,191),PRESET,BF:LINE(0,0)-(5,191),PRESET,BF:LINE(250,0)-(255,191),PRESET,BF
52 FOR C=1TO4
53 PCOPY C TO C+4
54 NEXTC
60 CLS0:PRINT@130,"PLEASE WAIT";
65 PMODE4,1:SCREEN1,1
70 LINE(189,141)-(252,188),PSET,BF
80 FORS=1TO40
90 Z=RND(LEN(ST$(B)))
100 IF Z/2=INT(Z/2) THEN Z=Z+1
110 IF Z>LEN(ST$(B)) THEN Z=Z-2
120 A=VAL(MID$(ST$(B),Z,2))
125 IF A=CK THEN 90
130 GOSUB310
140 NEXTS
150 PMODE4,1:SCREEN1,1
155 A=B
160 A$=INKEY$:IF A$="" THEN 160
170 IF A$=CHR$(94) THEN A=A+4:GOTO220
180 IF A$=CHR$(10) THEN A=A-4:GOTO220
190 IF A$=CHR$(9)  THEN A=A-1:GOTO220
200 IF A$=CHR$(8)  THEN A=A+1:GOTO220
210 IF A$=CHR$(32) THEN GOTO2000
220 IF A>16 OR A<0 THEN 250
221 FOR C=1 TO LEN(ST$(A)) STEP2
222 V$=MID$(ST$(A),C,2)
230 IF VAL(V$)=B THEN GOSUB 310:GOTO150
240 NEXTC
250 SOUND40,4:A=B:GOTO150
310 Q=A:GOSUB 1000
315 X1=D:Y1=E
325 Q=B:GOSUB1000
326 A1=D:B1=E
330 GET (X1,Y1)-(X1+63,Y1+47),A,G
340 PUT (A1,B1)-(A1+63,B1+47),A,PSET
350 LINE(X1,Y1)-(X1+63,Y1+47),PSET,BF
360 CK=B:B=A
370 RETURN
510 ST$(1)="0205"
520 ST$(2)="010306"
530 ST$(3)="020407"
540 ST$(4)="0308"
550 ST$(5)="010609"
560 ST$(6)="02050710"
570 ST$(7)="03060811"
580 ST$(8)="040712"
590 ST$(9)="051013"
600 ST$(10)="06091114"
610 ST$(11)="07101215"
620 ST$(12)="081116"
630 ST$(13)="0914"
640 ST$(14)="101315"
650 ST$(15)="111416"
660 ST$(16)="1215"
670 RETURN
1000 ON Q GOTO 1010,1020,1030,1040,1050,1060,1070,1080,1090,1100,1110,1120,1130,1140,1150,1160
1010 D=0:E=0:RETURN
1020 D=63:E=0:RETURN
1030 D=126:E=0:RETURN
1040 D=189:E=0:RETURN
1050 D=0:E=47:RETURN
1060 D=63:E=47:RETURN
1070 D=126:E=47:RETURN
1080 D=189:E=47:RETURN
1090 D=0:E=94:RETURN
1100 D=63:E=94:RETURN
1110 D=126:E=94:RETURN
1120 D=189:E=94:RETURN
1130 D=0:E=141:RETURN
1140 D=63:E=141:RETURN
1150 D=126:E=141:RETURN
1160 D=189:E=141:RETURN
2000 PMODE4,5:SCREEN1,1
2010 A$=INKEY$:IF A$="" THEN 2010
2015 PMODE4,1:SCREEN1,1
2020 GOTO150
```

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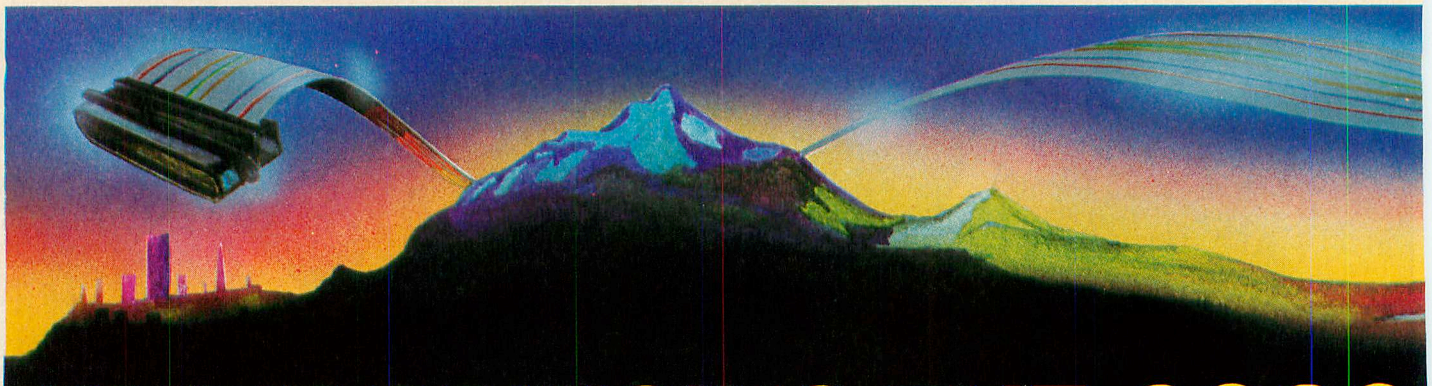

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THE RAINBOW and the Delphi Information Utility have joined together to allow CoCo owners all over the world to connect with one another!

Delphi is a full-service information utility. It offers everything from up-to-the-minute news stories from The Associated Press to electronic mail services. But, *best of all*, it now has **a special forum for Color Computer owners, and it's operated by the people who bring you THE RAINBOW each month.**

The CoCo Special Interest Group (SIG) features a variety of services, including an open forum where you can send and receive messages from Color Computer owners all over the world. It also has several databases to which you can upload your favorite programs and from which you can download programs written by other CoCo enthusiasts. Some of these databases are BASIC programming, OS-9 and home applications.

When setting up your account with Delphi, if you do not have a credit card or prefer not to use it, Delphi requires that you send $20 to give your account a positive balance. This will be refunded after your first free hour if you choose to no longer use the system or it will be applied to future connect charges.

PEEK INTO THE RAINBOW

The CoCo SIG's conference feature allows you to meet electronically with other members of the CoCo Community. You can join conferences with notables such as Dale Puckett, Cray Augsburg, Marty Goodman, Don Hutchison, Jim Reed, Lonnie Falk and others — on a regular basis. Conference schedules will appear in THE RAINBOW each month. Be sure to check online announcements for changes and additions.

THE OTHER SIDE OF THE RAINBOW

On Delphi, you also are able to buy RAINBOW ON TAPE — order a whole set, or download an individual program immediately. You can also renew your RAINBOW subscription, make a fast and easy order for software or hardware from a multitude of vendors, or inquire about products on the CoCo SIG.

We also have a number of **programs that you can download** and use, just for the cost of the time you spend transferring them. There'll also be **corrections for RAINBOW articles,** helpful hints and many other useful features.

Between now and August 31st, take advantage of our "Late Rates." This summer discount applies between 2 a.m. system time (EDT) and 7 a.m. local node time.

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THE RAINBOW is offering subscribers a free lifetime subscription to Delphi — a $24.95 value — and a free hour of connect time — a $7.20 value at either 300, 1200 or 2400 Baud — so you can sample Delphi and the RAINBOW CoCo SIG. That's right. Your subscription to THE RAINBOW entitles you to this $32.15 value as a ***free bonus!***

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DELPHI TYPE:

GROUP COCO

COMMUNITY TOGETHER

How to reach RAINBOW's Color Computer SIG . . .

There are several ways to connect to Delphi and THE RAINBOW's CoCo SIG. In most cities you will not even have to pay long distance charges; you can use special data communications networks like Uninet, Tymnet and the Canadian Datapac network.

First, set your terminal program to operate at either 300 or 1200 Baud (depending on the modem you have), and also select either 7 bits with even parity or 8 bits with no parity, and one stop bit. (If one combination doesn't work, try another.)

Decide which network you should use. There is no surcharge for Uninet or Tymnet. Canadian residents using Datapac will be charged an additional $12 (U.S.) per hour.

On Uninet: Call (800) 821-5340 to get the Uninet number for your area. After you call the appropriate number for your own area and make connection, you'll see a prompt of "L?" Press ENTER, the period key (.) and ENTER again. At the "service:" prompt, type `GVC` (for General Videotex Corporation) and ENTER.

On Tymnet: Call (800) 336-0149 to get the Tymnet number for your area. After you dial your designated number and connect, you will see either "garbage" or a message saying "please type your terminal identifier." At this point, even if the screen is garbled, simply press 'A'. When "please log in:" appears, type `DELPHI` and press ENTER.

From Canada (on Datapac): Call Delphi Customer Service at (617) 491-3393 to get the Datapac number for your area. After you connect, press the period key (.) and ENTER (use two periods if you're using 1200 Baud). Type `SET 2:1, 3:126` and press ENTER. Now type `p 1 3106, DELPHI;` and press ENTER. Delphi's new rates indicate an additional $12 hourly surcharge for evening use of Datapac, which means a total of $18 (U.S.) for connect time.

From other countries: Many countries have their own data networks that can connect to either Uninet or Tymnet. Check with the telephone authorities in your country for details on how to sign up for this service. When you have an account set up, you can reach Delphi with a "host code" of 312561703088 through Uninet, or 310600601500 through Tymnet. (You'll have to pay the toll charges for this connection.)

Type in Your Username

If you're already a subscriber to THE RAINBOW, at the "USERNAME:" prompt, type `RAINBOWSUB` and press ENTER. At the "PASSWORD:" prompt, type your individual subscription number from the mailing label of your latest issue of THE RAINBOW. (If there are one or more zeros at the beginning of this number, include them.)

If you don't already have a subscription, at the "USERNAME:" prompt, type `RAINBOWORDER` and press ENTER. At the "PASSWORD:" prompt, type `SENDSUB` and press ENTER. Have your MasterCard, VISA or American Express card ready, because you'll be led through a series of questions that will enable us to put your RAINBOW and Delphi subscriptions into effect. In an effort to hold down non-editorial costs, we do not bill for subscriptions.

If you make a typing error, just press `ENTER` and start over. Remember that at any point, when you're on Delphi, you can type `HELP` to get help on how to use the system. To get off the system just type `BYE`.

If you find that you're unable to log on to Delphi and enter the CoCo SIG after following these instructions, call us during afternoon business hours at (502) 228-4492. We'll be glad to offer assistance.

Come Visit Us! Type: `GROUP COCO`

After you sign in, you'll be prompted to set up your own, personal "user name" — Delphi is a friendly service, no numbers to remember — and you'll be asked a number of questions so Delphi can set up your account. You'll also be assigned a temporary password. No time is assessed against your free hour of service while you answer these questions.

Delphi will tell you that your account will be ready after 6 p.m. the same day if you sign up before noon (Eastern time zone.) If not, your account will be ready at 6 p.m. the next day. Once an account is opened, *each RAINBOW subscriber will be credited with an hour of free time!*

When you log back in, use your chosen username and your temporary password to access the system. At that point, you will meet Max, who will help you configure things and will change your temporary password into your own *personal* password. This is the password you will use for subsequent sessions — or until you change it.

After Max bids you goodbye, you'll wind up at the Delphi Main Menu; type in `GROUP COCO` and **join us on the CoCo SIG!**

16K
Disk

A modification for VIP Writer

WRITER-ZAP

By Ian Millard

We have all heard the talk about enhanced word processors for the CoCo. At my company, Duck Productions, we use *Vip Writer* to produce the preliminary phases of design, charting and documentation for our utility programs. I want to compliment VIP Technologies on the simplicity and full-featured quality they have developed in this application software. As consumers, we have not found any short suits during the everyday marathon usage we have.

However, we are not average users either, since we answered the only negative aspect of *Writer* long ago. We know the value in modifying start-up parameter defaults (e.g., page formats, tabs and printer codes) to avoid repetitive keying of the same things. We use three printers, all using different Baud rates, and each operation works to different page/tab parameters. We answered this need with a utility to modify a separate *VIP Writer* for each document application.

As a new company, Duck Productions would like to present this *VIP Writer* utility modification to all CoCo users.

Writer Zap is a disk zap dedicated to the mission of defining your own (47) defaults in *VIP Writer.* Operation is prompted for ease of use. We recommend you back up a fresh copy of *VIP Writer* for the modification. (Do not modify the original VIP/Softlaw disk or material.)

Type in *Writer Zap* and run. You may want to get out the printer manual in advance, or think about the margins and other defaults you are able to change. *Writer Zap* automatically looks for and modifies either *VIP Writer* alone or the *Desktop Writer* version. *Writer Zap* is error trapped and will not modify any disk other than *VIP Writer* or *Desktop.*

Writer Zap provides the current memory value for tab positions, print format parameters and printer codes with each prompted option for default change. If no change is desired, a simple carriage return (ENTER) leaves the value unchanged.

Note: Printer control codes are usually preceded by an escape code (e.g., 27 as in 27;10); however, some codes, like underline codes, are not. *VIP Writer* has provided the (CLEAR) three or four positions for such solo codes. As a result, these two positions do not lend themselves to change as they will not accept the two-digit escape code needed by most other printer functions.

By the way, during the course of running this program, it will also modify your *VIP Writer* disk to auto-boot by typing the BASIC command DOS. You only receive this little extra when *Writer Zap* determines there is enough disk space to accommodate the function. There is not enough space to do this with *Desktop.*

We hope this utility gives you many hours of enjoyment in what you *don't* have to do. Happy computing! ☐

Ian Millard is the president of Duck Productions, a computer products company new to the CoCo Community. His previous responsibilities have been dedicated to electronic and computerized medical equipment systems for use in hospital operating rooms throughout southern Ontario.

130 169
330 168
440 250
540 235
END 169

The listing: WRITRZAP

```
10 CLEAR 2000:DIM FP$(27):VERIFY
 ON
20 FOR A=1TO27:READ FP$(A):NEXTA
30 FOR A=3584 TO 3652:READ B:POK
E A,B:NEXT A:EXEC&HE00
40 PRINT@160,"  VERIFY FUNCTION
 ON  [Y/N]":EXEC44539:A$=INKEY$
:IF A$="N" THEN V$="N" ELSE IF A
$<>"Y" THEN 40
50 PRINT@256,"    INSERT THE SUBJ
ECT DISK IN        DRIVE 0  AND P
RESS ENTER"
60 EXEC44539:IF INKEY$<>CHR$(13)
 THEN 60
70 FOR C=3 TO 5:DSKI$0,17,C,A$,B
$:A$=A$+LEFT$(B$,126)
80 FOR D=1 TO 254 STEP 32
90 IF MID$(A$,D,6)="WRITER" THEN
 A=2:B=3:GOSUB 540:GOTO 120
100 IF MID$(A$,D,7)="DESKTOP" TH
EN A=8:B=6:GOTO 120
110 NEXT D:NEXT C:PRINT@384,"
NO VIP WRITER ON THIS DISK":END
120 CLS:PRINT@35,"PART ONE   - TA
BS -"
130 DSKI$0,A,B,A$,B$:POKE65344,0
:E=58
140 IF MID$(B$,57,3)<>"[DO" THEN
 PRINT@384,"       INCOMPATIBLE V
ERSION":END
150 FOR C=95 TO 104:E=E+32:PRINT
"#"C-94"IS NOW"ASC(MID$(B$,C,1))
;:INPUT"  NEW VALUE";D
160 IF D=0 THEN PRINT@E,ASC(MID$
(B$,C,1)):GOTO 180
170 MID$(B$,C,1)=CHR$(D)
180 NEXT C
190 GOSUB 530:IF AN$="N" THEN130
200 DSKO$0,A,B,A$,B$
210 CLS:T$="PART 2 - PRINTER CON
TROL CODES":PRINT@33,T$
220 DSKI$0,A,B,A$,B$:POKE5344,0
230 C$=B$:C=126:D$="1":GOSUB 340
240 DSKO$0,A,B,A$,C$:B=B-1
250 DSKI$0,A,B,A$,B$:POKE65344,0
260 C$=A$:C=1:D$="2":GOSUB 340
270 C=8:D$="5":GOSUB 340
280 C=11:D$="6":GOSUB 340
290 C=14:D$="7":GOSUB 340
300 C=17:D$="8":GOSUB 340
310 C=20:D$="9":GOSUB 340
320 C=23:D$=":":GOSUB 340
330 DSKO$0,A,B,C$,B$:GOTO 420
340 CLS:PRINT@33,T$:E=ASC(MID$(C
$,C,1)):F=ASC(MID$(C$,C+1,1))
350 PRINT@132,"<CLEAR> "D$
360 PRINT@192,"ESCAPE CODE IS"E;
:INPUT" NEW CODE";G:IF G=0 THEN
G=E
370 PRINT@220,G:PRINT@256,"CONTR
OL CODE ="F;:INPUT" NEW CODE";H:
IF H=0 THEN H=F
380 PRINT@284,H:GOSUB 530:IF AN$
="N" THEN 350
390 MID$(C$,C,1)=CHR$(G):MID$(C$
,C+1,1)=CHR$(H):RETURN
400 DATA AL,AS,BD,BL,BM,BS,FL,FS
,HL,HS,IP,JU,LF,LM,LS
410 DATA NL,NP,PA,PC,PG,PH,PL,PN
,PP,RM,TM,WD
420 CLS:T$="PRINTER FORMAT CODES
":PRINT@38,T$
430 A=A+3:DSKI$0,A,B,A$,B$:POKE6
5344,0
440 P=0:FOR C=37 TO 64:IF C=59 T
HEN 510
450 P=P+1:D=ASC(MID$(B$,C,1)):IF
 D<191 THEN D$=RIGHT$(STR$(D),LE
N(STR$(D))-1):GOTO 470
460 D=D-128:D$=CHR$(D)
470 PRINT@128,"CODE "FP$(P)" NOW
="D$;:INPUT"   CHANGE TO";E$:IF
E$="" THEN E$=D$
480 GOSUB 530:IF AN$="N" THEN 47
0
490 E=VAL(E$):IF E=0 THEN E=ASC(
E$):IF E>64 THEN E=E+128 ELSE E=
E-48
500 MID$(B$,C,1)=CHR$(E)
510 NEXT C
520 DSKO$0,A,B,A$,B$:POKE65344,0
:CLS:PRINT"FINISHED":END
530 IF V$="N" THEN RETURN ELSE P
RINT@485,"IS THIS CORRECT   [Y/N]
";:EXEC44539:AN$=INKEY$:IF AN$<>
"Y" AND AN$<>"N" THEN 530 ELSE R
ETURN
540 DSKI$0,17,2,A$,B$:IF MID$(A$
,67,1)=CHR$(255) THEN MID$(A$,67
,1)=CHR$(193) ELSE RETURN
550 DSKO$0,17,2,A$,B$:DSKI$0,2,1
,A$,B$
560 MID$(A$,1,5)="OS"+CHR$(0)+CH
R$(0)+CHR$(18):DSKO$0,34,1,A$,B$
:RETURN
570 DATA 198,32,189,169,42,142,4
,42,49,141,0,23,141,2,32,13,166,
160,129,64,38,1,57,128
580 DATA 64,167,128,32,243,142,4
,101,141,238,57,87,82,73,84,69,8
2,96,90,65,80,64,70,82
590 DATA 79,77,96,68,85,67,75,96
,80,82,79,68,85,67,84,73,79,78,8
3,64,18
```

Introducing

Lyra™

The Musical Coco Max™

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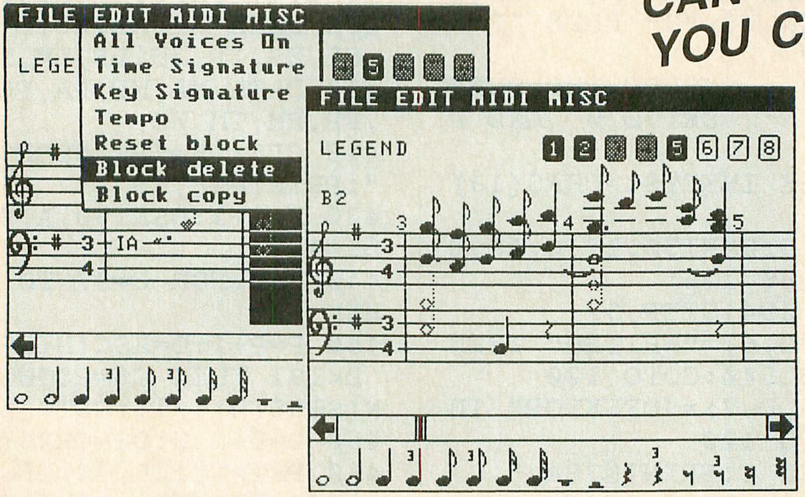
ICONS!



A MUST FOR MIDI USERS

LYRA is the most powerful music composition program we have seen on any computer. We don't mean just the COCO, we really mean any computer. Whether you are a novice trying to learn music or a professional musician with MIDI equipment you will find LYRA a powerful tool. You see, we wrote LYRA for musicians that hate computers. If you want proof, purchase a LYRA demo for $7.95. We will apply the demo price to your purchase. MIDI output requires the LYRA MIDI cable (#MC158) or COCO MIDI Seq/Editor (#CM147).

- ✓ Ultra Easy to use, just point with joystick or mouse and click.
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  - Note insert — Block insert
  - Note delete — Block delete
  - Note change — Block copy
- ✓ Output music to:
  - TV Speaker — Monitor Speaker
  - STEREO PAK — ORCHESTRA 90
  - SYMPHONY 12 — COCO MIDI S/E
  - MIDI Synth — MIDI Drum Machine
- ✓ Output up to 4 voices without additional hardware.
- ✓ Output all 8 voices using either SYMPHONY 12 or one or more MIDI synthesizers and drum machines.
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- ✓ Modify music to any tempo.
- ✓ Automatically inserts bar for each measure as you compose.
- ✓ Key signature lets you specify sharps and flats only once, LYRA will do the rest.
- ✓ Plays MUSICA 2 files using LYRA CONVERT (#LC164).
- ✓ Each voice may be visually highlighted or erased.
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LYRA (Disk Only) #LY122 .... **$54.95**

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Plugs into the COCO ROM cartridge slot allowing easy connection to your stereo system.
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A collection of over 800 songs. When used with CONVERT, it gives an incredible LYRA library. Each volume 100 songs.
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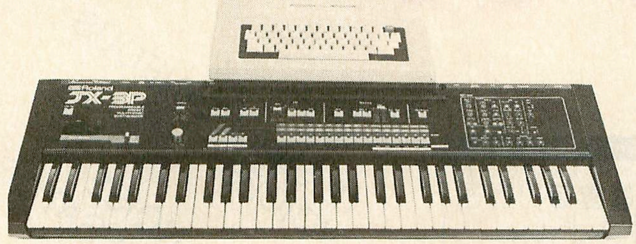

- Supports up to 16 tracks.
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- May be used as a sequencer.
- User friendly graphics display.
- Menu driven.
- Metronome available.
- Real time recording.
- Save your masterpiece to disk.
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- Tracks may be deleted, copied, transposed, or mixed.
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MUSICA MIDI™

MUSICA MIDI takes any MUSICA 2 music file and plays it through your MIDI synthesizer. We offer you over 800 tunes from our MUSIC LIBRARY series (sold separately) or create your own music using MUSICA 2. Includes: documentation, plenty of music, and the cable to connect between the COCO and your synthesizer.
Tape or Disk. #CM126 . . . . **$39.95**

DX-7 LIBRARIAN™

RAM cartridges for the Yamaha DX-7 aren't cheap and don't hold all the sounds you would like. The DX-7 LIBRARIAN is a program that when used with COCO MIDI, lets you save and load any number of sounds. Save sounds individually or as a group letting you load the DX-7 in seconds.
Disk only. #DX143 . . . . **$29.95**

MIDI KEYBOARD

If you own the Casio CZ-101 or similar MIDI synth, you know that the mini keys and the short 3 or 4 octave keyboard is limiting. MIDI KEYBOARD when used with our full size 5 octave keyboard gives you the flexibility you need. Comes with cable to connect the COCO to your MIDI synth.
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MUSIC LIBRARY 300 (another 100 selections)
MUSIC LIBRARY 400 (another 100 selections)
MUSIC LIBRARY 500 (another 100 selections)
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40 disks
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12 SIMULTANEOUS VOICES

4 NOISE GENERATORS

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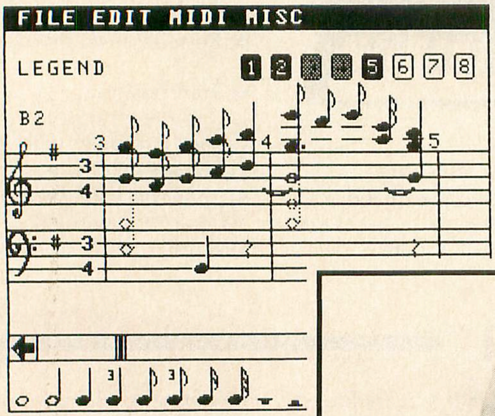
SOUND EFFECTS



musical applications of microprocessors

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LYRA SYMPHONY 12 ENHANCER #LS177	**$19.95**
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This program, written by a guitar instructor of 17 years, displays in high resolution graphics the exact fingering for over 100,000 chord combinations. You may even tune your guitar to the computer and play along. Whether you are a beginning guitar student or an advanced player, you will find this quick reference to guitar chords invaluable.

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A more advanced course that deals with: Major and Harmonic Minor scales, interval spelling, Triad (Chord) theory, Inversions, Dominant 7th chords, and ear training of the intervals.

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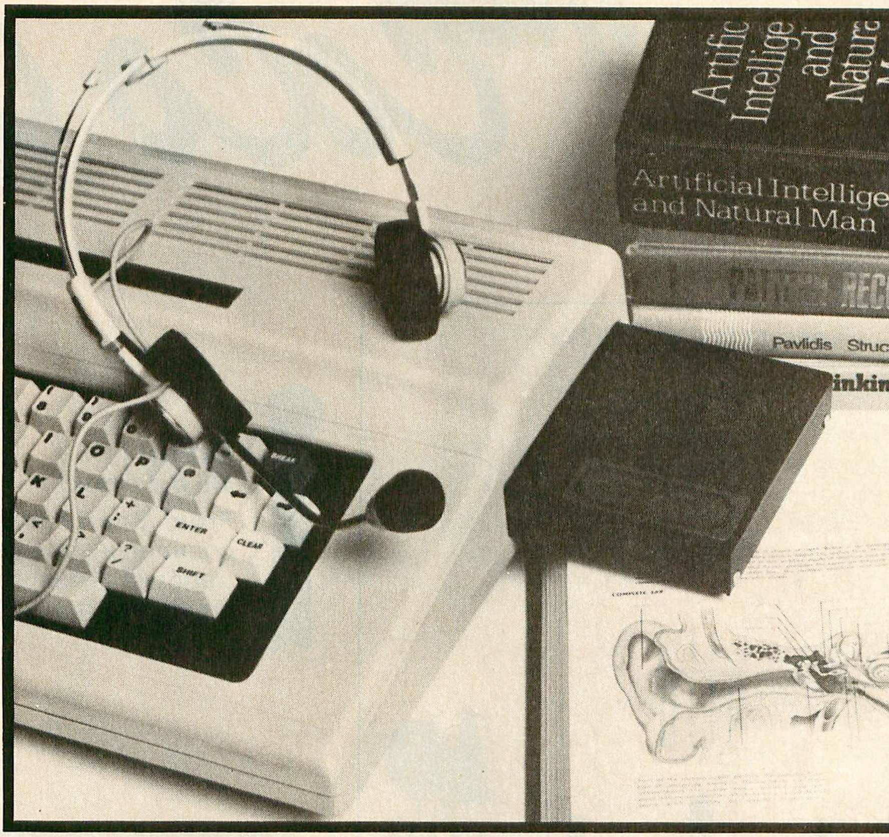
Artificial Intelligence and Natural Man
Artificial Intelligence and Natural Man
Margaret Bode
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Hands Off Programming. Imagine writing your own BASIC programs without ever touching the keyboard. Everything that you would normally do through a keyboard can now be done by just speaking.

Programming EARS Is Easy. LISTEN, MATCH and other commands have been added to BASIC so that programming EARS is a piece of cake! The single BASIC line: 10 LISTEN: MATCH will instruct EARS to listen to you and return the matching phrase.

It Talks. EARS is also capable of high quality speech. We mean REALLY high quality. The speech is a fixed vocabulary spoken by a professional announcer. Speech Systems is currently creating a library of thousands of high quality words and phrases. For a demonstration call **(312) 879-6844**, you won't believe your ears or our EARS.

DISK OWNERS. EARS will work with any disk system with either a MULTI-PAK or Y-CABLE. Our new Triple Y-CABLE was specifically developed for those wishing to add SUPER VOICE as a third device.

You Get Everything You Need. You get everything you need including a specially designed professional headset style noise cancelling microphone. The manual is easy to use and understand. Several demonstration examples are included so you don't have to write your own programs unless you want to. EARS will work in any 32K or 64K Color Computer.

SUPER VOICE $20 OFF

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Applications for EARS are astounding. Here is our first of many listening programs to come. VOICE CONTROL is a program specifically designed to allow you to control any appliance in your house with your voice and our HOME COMMANDER (sold separately) or the Radio Shack Plug 'N' Power controller. For example, you can control your TV by saying "TV ON" or "TV OFF". . **$24.95**

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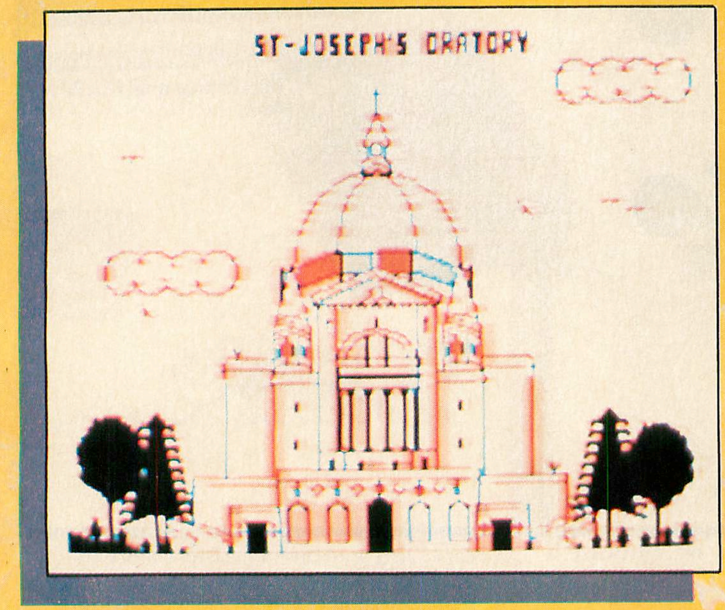
The CoCo Gallery



1st PRIZE

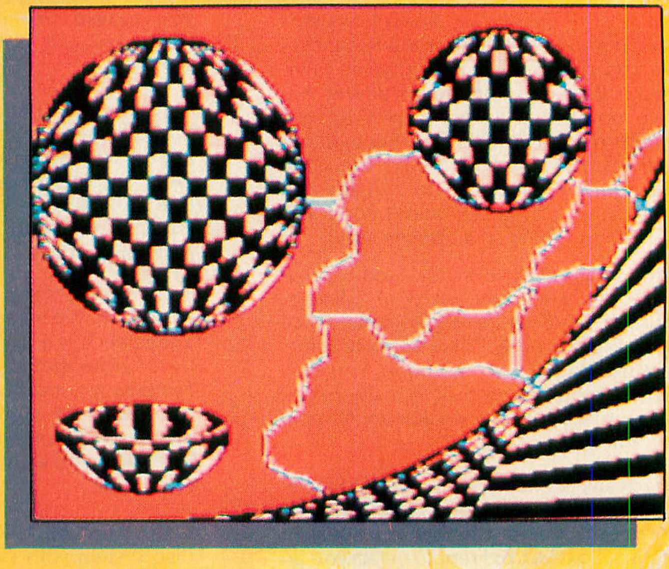
Oratory
Michel Gravel

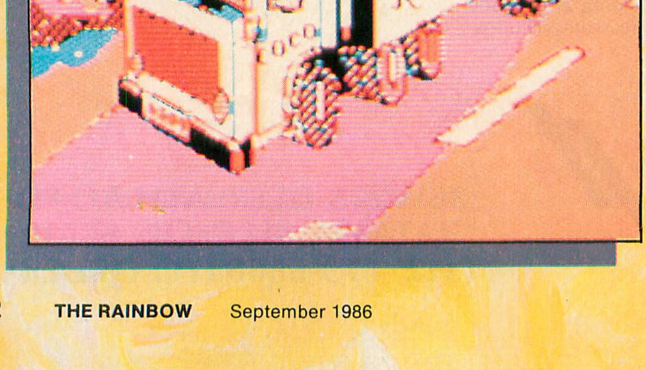
From Sherbrooke, Ontario, Michel commences the gallery with this illustration of divinely inspired architecture created with BASIC.

2nd PRIZE

Beyond
Charles Farris

Utilizing the abilities of *CoCo Max*, Charles takes us into another world of dimensional arrays. Charles created this while serving in the United States Air Force.





3rd PRIZE

Truck
Stephen Brink

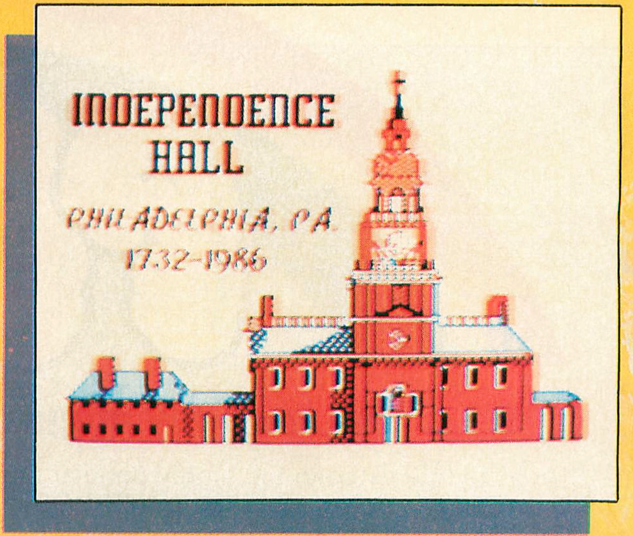
Truckin' on for third prize from St. Paul Minnesota is Stephen's conception of "CoCo Cruisin," created with *CoCo Max*.

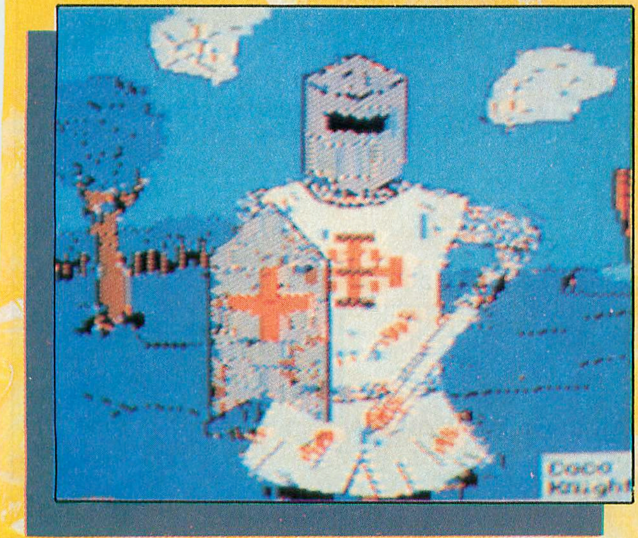
Independence Hall

James Stewart

HONORABLE MENTION

Depicting one of America's historical edifices, James, who lives in Highland Falls, New York, used *CoCo Max* for this memorable creation.





The Knight

Wayne Finlay

HONORABLE MENTION

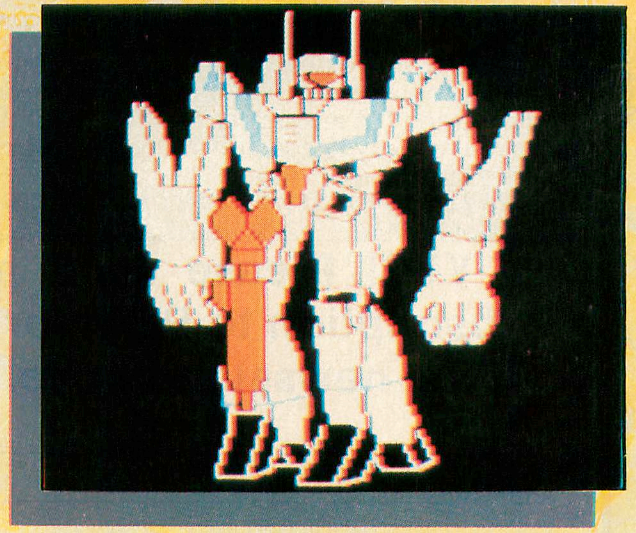
Wayne, who lives in Scarborough, Ontario, used *CoCo Max* for his renaissance of a robust knight in shining armor.

Robot

Jamie Flamm

HONORABLE MENTION

Taking the patrons of the gallery into the sphere of automation, Jamie created this mechanical man with the use of BASIC from his hometown of Peabody, Massachusetts.



SHOWCASE YOUR BEST!

You are invited to nominate original work for inclusion in upcoming showings of "CoCo Gallery." Share your creations with the CoCo Community!

Be sure to send a cover letter with your name, address and phone number, detailing how you created your picture (what programs you used, etc.) and how to display it. Also, please include a few facts about yourself.

Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere. A digitized copy of a picture that appears in a book or magazine is *not* an original work.

We will award a first prize of $25, a second prize of $15 and a third prize of $10. Honorable mentions will also be given.

Jody Doyle, Curator

Send your entry on either tape or disk to:

CoCo Gallery
THE RAINBOW
P.O. Box 385
Prospect, KY 40059
Attn: Jody Doyle

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The monthly magazine that's reader-friendly

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Let's Take a Look at the CoCo 2 B

By Tony DiStefano
Rainbow Contributing Editor

This week I had the honor of repairing an old 'D' board Color Computer belonging to "KISSable OS-9" author Dale L. Puckett. Although there are a lot of old CoCos still out there, you can't get any more of them. Today, Radio Shack is peddling a CoCo with the letter 'B' in the catalog number. I don't know what the 'B' stands for, but there are a few changes inside. I bought one at the Palo Alto RAINBOWfest. What I want to do here is explain some of the changes Radio Shack has made.

The first thing I noticed when I opened the box is that it says Tandy on the computer and not Radio Shack. It also says Color Computer and not CoCo 2. This is the smallest PCB (Printed Circuit Board) I have seen for a CoCo. Small is good in many ways. First, it costs less to produce. It also has the least parts count of all the CoCos ever made. Not only is this good for production costs, it's also good for users. The lower the parts count in a computer, the less likely a breakdown. Then there is the question of heat; all electronic parts, whether digital or analog, dissipate heat. How many times have you heard that the computer crashes when it is too hot? Fewer parts mean less heat.

This computer does not have any regulated 12 volts, the same as the other CoCo 2s. There is no negative voltage available except on the SALT chip, which buffers and converts the RS-232 signals. In theory, RS-232 specifies that the signal be +/-12 volts. This new CoCo 2 (and all other CoCo 2s) have only +/-5 volts. While this will work with most RS-232 devices, check the specifications to be sure. Again, as with the other CoCo 2s, there are about 12 volts unregulated at the power diodes, which can be used for devices needing the voltage. The diodes are numbered D10 and D11. Remember, the side with the white band is the positive side.

The next interesting part in this CoCo 2 B is a PIA (Peripheral Interface Adapter). The first CoCos had two PIAs of the same kind. They were both MC6821s by Motorola. The next stage of the CoCo had one MC6821 and one MC6822. This 6822 is called an IIA (Industrial Interface Adapter). There is just a small difference between the two. Now the second PIA in the CoCo 2 B is no longer an MC6822, but an SC67331P. It is a Motorola part, and compatible with the MC6822. The difference is in the impedance matching between the keyboard and the PIA — custom made for Tandy, no doubt. If you happen to destroy this part, a regular MC6822 will work. The keyboard matrix is the same.

As with the CoCo 2 A, there are six jumpers, J1 to J6. One of the jumpers is used to detect the presence of 64K memory RAM. The other five jumpers are labeled 64K/128K. A lot of people think that this means you can have 128K of RAM. This is not true. Look again; there is only one place for ROM. Before, there were two sockets, one for the BASIC ROM and the other for the Extended BASIC ROM, each ROM being 8K long. A ROM's capacity is usually expressed in bits. In the CoCo, the data bus is eight bits wide. Therefore an 8K ROM has 8K times eight bits, giving you 64K bits. Starting to get the picture? Since there is only one place on the PCB for BASIC and Extended BASIC, a new chip with both 8K ROMs (or 64K bits) gives you 16K or, like the label says, 128K.

If you bought the computer without Extended BASIC, you got a socket and an 8K ROM in a 28-pin package. The jumpers are set to the 64K position. If you bought an Extended BASIC machine, you got a soldered-in 16K ROM with the jumpers set to the 128K side. In both cases you got a new version of BASIC, Version 1.3. If you have Extended BASIC, then you only see the

---

Tony DiStefano is well-known as an early specialist in computer hardware projects. He lives in Laval Ouest, Quebec.

Extended BASIC Version, 1.1. To see the BASIC version type in `EXEC 41175`.

To take this further, the two ROMs Tandy uses, 8K and 16K, are pin-for-pin compatible with two EPROM counterparts. The 28-pin BASIC ROM is compatible with the Intel 2764 EPROM. The 28-pin Extended BASIC ROM is compatible with the Intel 27128 EPROM. Now you can see where the 64K/128K numbers come from. If you have an EPROM programmer, modify these ROMs to suit yourself and plug them right in. Of course, if the ROM is soldered in, you will have to desolder it and put in a socket. Don't forget to change the jumpers to the right place. More on this later.

The RAM portion is quite impressive. There are three ways to add 64K to this CoCo 2 B. If you have 16K of RAM on the computer, chances are the chips Tandy used are two 4416 RAM chips. These chips are 16K by four bits each. Since the CoCo needs eight bits, there are only two of these chips. These chips are in the two 18-pin sockets between the two white connectors. The first way to upgrade this 16K computer is to change these two chips for the 64K counter part. The number to this is 4464. There are a lot of different numbers that are compatible with this chip. Just ask for a 4464, a 64K by four DRAM or an equivalent.

With the computer turned off, remove the two memory chips and install the two new ones. On the left side, there is a white box marked J6, jumper 6. You must solder a jumper across the two pins inside this box. This tells the software that there are 64K memory chips installed. That's all there is to it.

The next way to upgrade is using the two white connectors. These connectors consist of all the lines necessary to connect 64K of memory. A small PCB will be necessary. The pinouts to the connectors are in Figure 1.

CN3		CN4	
Pin	**Function**	**Pin**	**Function**
1	GND	1	GND
2	+5V	2	A7
3	A4	3	A3
4	A5	4	A2
5	A6	5	A1
6	RAS	6	A0
7	$\overline{WE}$	7	DQ6
8	DQ1	8	DQ5
9	DQ0	9	DQ7
10	DQ3	10	DQ4
11	DQ2	11	CAS
12	GND	12	GND

Figure 1

There are two reasons why I'm not going into details on how to construct this piggyback board. The first is that it is available, fully assembled and tested, from CRC Inc. (514) 383-5293 for a modest price, and the other reason is that there is a third method of upgrading this CoCo 2 B.

If you have some 64K chips lying around gathering dust, you'll like the third way to upgrade. See all those holes filled with solder? Do you see the eight empty IC names soldermasked on the PCB? These eight blank areas are made for 64K memory chips. The regular run of the mill 4164s. All you have to do is add eight sockets and plug them right in. There is a small catch: The holes for these ICs are filled with solder. You must first empty the holes of their solder. You can use a device such as Radio Shack's desoldering pump (less than $20). Just heat up the hole to be cleaned with a hot soldering iron. Then bring the desoldering pump to the hole. Remove the iron, press the pump to the hole and press the pump button. Go through all the holes of each pin. It would be wise to solder in sockets, not the chips directly. On some boards, the eight decoupling capacitors are also missing. Insert eight .1 UF capacitors. As with any upgrade to 64K, don't forget to jumper the connections at J6. That's all there is to it.

There are a few more changes in the CoCo 2 B. Until now, all CoCos used the Motorola MC6847 as a display processor. This is the chip that gives the text on the screen and all of the graphics modes. Text on the screen has been green with black letters. When typing in lowercase letters, they would appear as inversed blocks of black with green letters. The new chip that Tandy uses on this CoCo 2 B is slightly different. It is an MC6847T1. (This chip might also have the part #XC80652P.) This chip is different. It has built-in real lowercase characters and you can also get rid of that border in certain cases. This is a real nifty improvement to the CoCo's display. The only problem with this is that Extended BASIC will not let you use these added features. Next month, I'll get my soldering iron out and add a few switches to change the default values.

The last change the good people at Tandy made was in the SAM (Synchronous Address Multiplexer). With all these changes to memory, video and circuitry, a new SAM chip is needed. It is the SN74LS785. A Motorola part that is upward compatible with the old SN74LS783 or the MC6883.

Back to the 28-pin ROM. Earlier, I mentioned that the ROM Tandy used is pin-for-pin compatible with an EPROM. A long time ago, a reader asked if there was a way to add a DOS chip inside the CoCo. Now there is. There are many ways to do this. Different people like to solder things together in different ways. I like the fastest and easiest way. Some people like to make it neat. The chip you must use is either a 2764 or a 27128. All of the address lines, data lines and power lines are the same. The only line that is different will be the chip select line. We'll get that line from another chip. The chip enable line on an EPROM is pins 20 and 22. These are the pins that must connect to the extra enable. The thing to do is connect all the pins except the two enable pins. Here is where some people differ. I used a 28-pin socket and soldered all the pins (except 20 and 22) to the 28-pin ROM. I bent pins 20 and 22 up and soldered them together, running a wire to Pin 12 of the 74LS138. That's the easy way.

Now, plug in the new EPROM and the cartridge area socket will be inside the CoCo. Some people don't like to solder directly to a ROM. Use a wire wrap socket and solder a second socket to the legs about halfway down. Cut pins 20 and 22 from the top socket. Solder these two pins to the 74LS138 mentioned above. Plug the ROM into the lower socket and the EPROM into the upper socket. The same results happen, but it is neater. No soldered ROM, but it is also a little more trouble. Take your pick.

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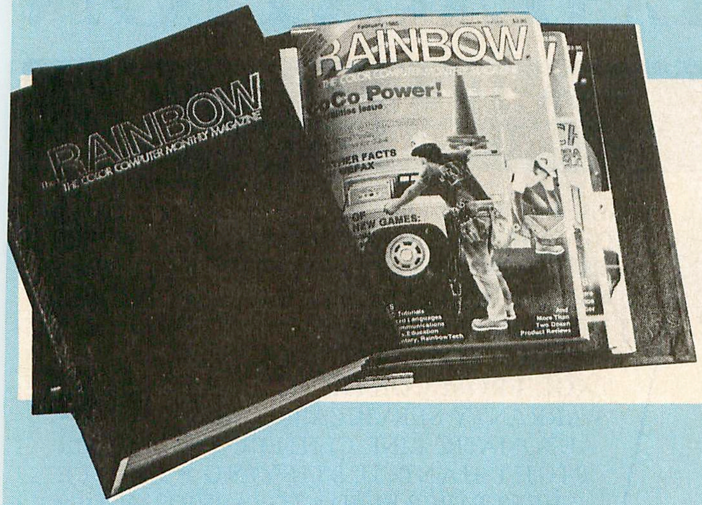

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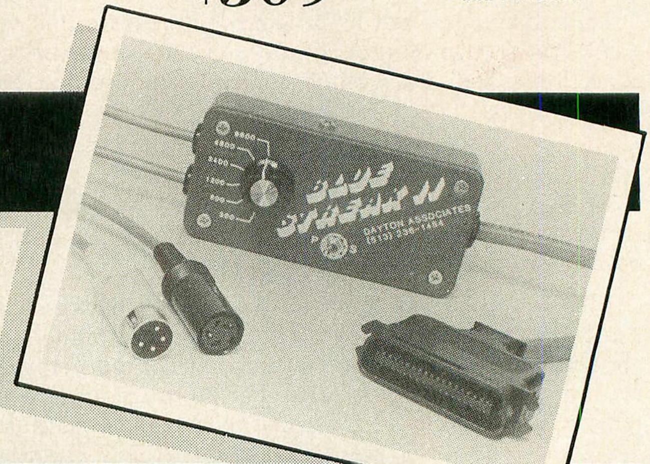
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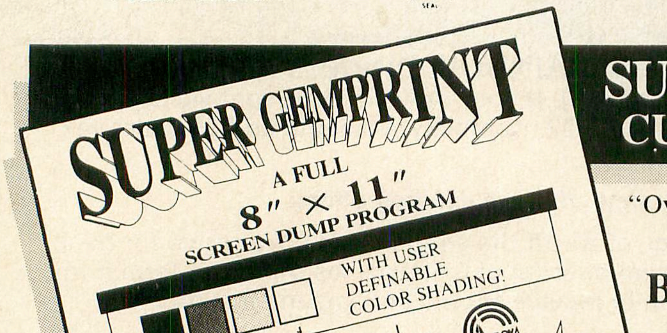
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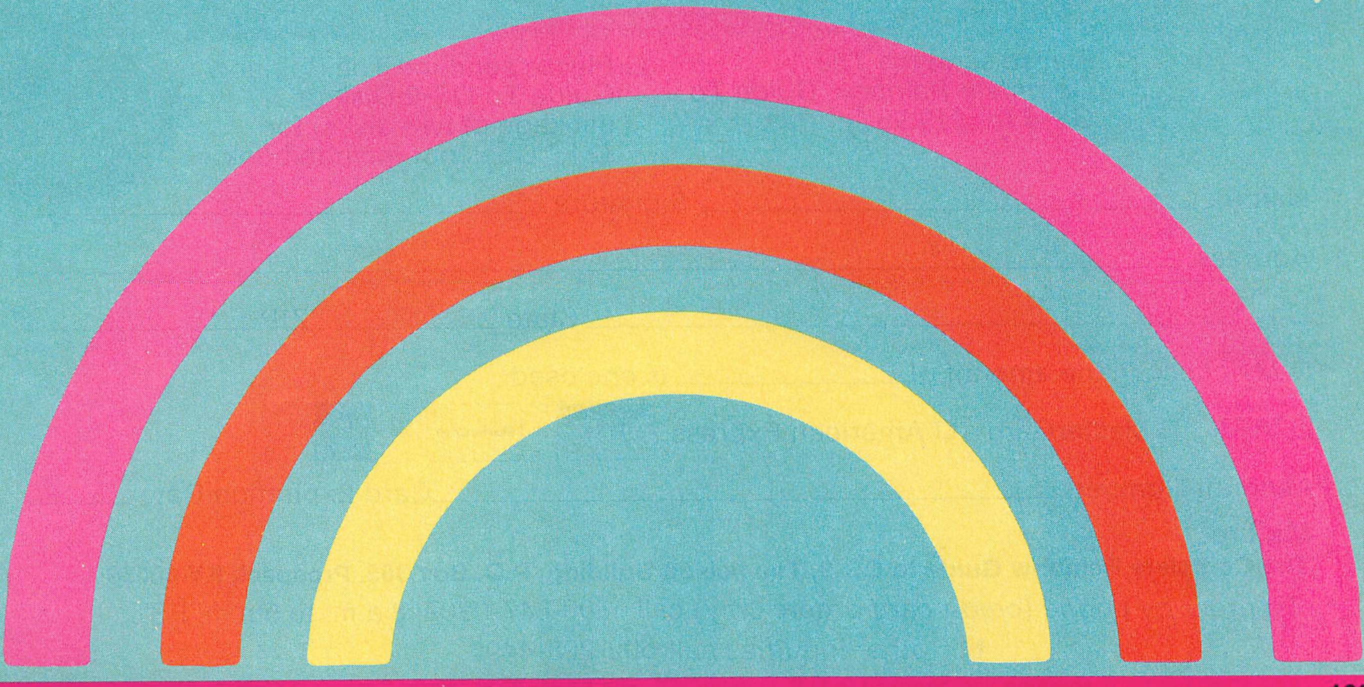

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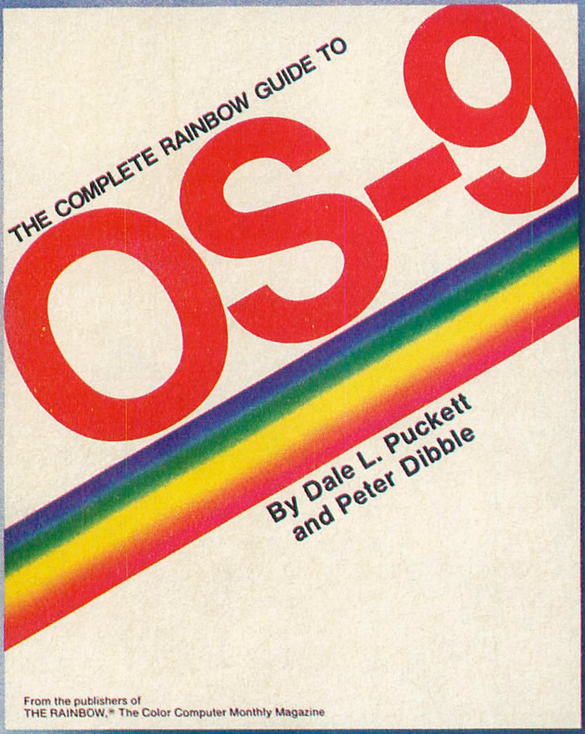
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This month the *Seal of Certification* has been issued to:

Checkers, a 32K computer version of one of the most popular board games. This program is designed to give many hours of entertaining, instructive and challenging action to players with varied levels of skill. *Applied Machine Intelligence, P.O. Box 358, Salida, CO 81201, tape or disk $3.95 plus $.85 S/H.*

Adventure Island, a 32K ML graphics Adventure. Your plane has crashed on a deserted island and you must use all your wits to stay alive. Half-screen picture graphics take you through jungle and beach. Comes on two disks. *Ark Royal Games, P.O. Box 14806, Jacksonville, FL 32238, $23.*

LISTER, a machine language utility program. This print utility lists BASIC programs to the screen, printer or disk/cassette files in an understandable manner. Included are spaces between keywords, hierarchical indentation of FOR/NEXT and IF/THEN/ELSE structures making it easier to debug programs. The program requires Extended Color BASIC and 16K. *CMD Micro Computer Services Ltd., 10447 124th Street, Edmonton, Alberta, Canada T5N 1R7, $14.95 plus $2 S/H.*

Seikosha SP-1000A Dot Matrix Printer, features a near-letter-quality mode as well as the standard data processing mode. Other features include italic font, front-panel control of margins, automatic paper ejection, a 1.5K buffer and 95 user-definable characters. This printer uses a nine-pin head and supports super- and subscripts. Paper can be fed to the printer by either the friction feed or the tractor feed mechanisms. *Distributed by Cinsoft, 2235 Losantiville Avenue, Cincinnati, OH 45237, (513) 396-7638, with interface $269, without interface $225.*

Mission: F-16 Assault, a 64K game requiring one joystick. Defeat the evil enemy forces by flying your F-16 jet fighter over enemy lines. *Diecom Products, 6715 Fifth Line, Milton, Ontario, Canada L9T 2X8, tape or disk, $28.95 U.S.; $38.95 Canada.*

Wall Street, a stock-market Simulation game requiring 16K Extended BASIC. *Drayon Software, P.O. Box 2516, Renton, WA 90856, tape or disk $6.*

Map 'n Zap, the layman's kit for disk repair. *Map 'n Zap* includes step-by-step instructions for repairing disk directories and granule tables. It also locates errors, maps out disk contents to printer or screen, backs up any flawed disk and prompts built-in disk zap for repair. *Duck Productions, 18 Rowe Court, Brampton, Ontario, Canada, L6X 2S2, $19.95 U.S., $24.95 Canada.*

Micro-Fire, a rapid-fire circuitry package that can be added to any joystick. It features on/off control and requires no extra power supply. *Micro-Fire* also has adjustable rate of fire. The preassembled hardware comes with a calibration program listing and complete instructions. *Duck Productions, 18 Rowe Court, Brampton, Ontario, Canada L6X 2S2, $19.95 U.S.; $24.95 Canada.*

Grafplot, a Color Computer high resolution data-graphing program that draws lines and/or scatter plots of user data. Mistakes are easy to correct and revised graphs are drawn in seconds. *Grafplot* lets you go effortlessly from raw data to a printed graph of professional quality. *Hawkes Research Services, 859 Stanford Avenue, Oakland, CA 94608, tape $40, disk $45.*

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CoCo Kameleon, serial-to-parallel printer interface for the Color Computer. Power is derived from the serial port and the printer data lines eliminating the need for external power source. *Spectrum Projects, Inc., P.O. Box 21272, Woodhaven, NY 11421, $49.95 plus $3 S/H.*

Wico CoCo Trackball Command Control, an input device designed to replace your CoCo joystick for games as well as other programs and applications. *Spectrum Projects, Inc., P.O. Box 21272, Woodhaven, NY 11421, $19.95 plus $3 S/H.*

The *Seal of Certification* program is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the product does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW's reviewers for evaluation.

— Judi Hutchinson

Full-featured *Mathpack* Simplifies Calculus

By John McCormick

This is the first program I have seen that attempts to handle real calculus problems on the CoCo, and it does a fine job.

The basic concept of numerically solving problems in integration isn't very complicated or new; it is shown in many BASIC text books. The most common is an implementation of Simpson's Rule, which breaks the problem into many small steps and solves it piece by piece.

The problem with Simpson's Rule is that a large number of calculations is required if you are trying to get an accurate answer, often 100 or more.

Mathpack is written in BASIC, but the calculations are finished in a reasonable time. This program also does root finding along with Cartesian, polar and parametric graphing.

When you get through the opening display and on to the main menu you find something interesting. The main menu is quite plain, with just a list of the program functions and none of the fancy art work that makes some programs more difficult to use by cluttering the screen. The really interesting part is the lettering; it is in true lowercase and quite easy to read.

The menu gives six options: Integration, Root Finding, Cartesian Grapher, Polar Grapher and Parametric Grapher along with End.

I won't attempt to explain any of these functions in depth because the program is not aimed at beginning students but, rather, at teachers and students already familiar with elementary calculus. If the program is suitable for your needs you will know what parametric graphs are, so I will only describe how the program works.

When you select Integration, you are first asked if the equation is a polynomial. If it is, there is a special procedure for entering the equation that will take a minute's study but really is quite simple. Essentially you just enter the coefficients of each term, using zero where appropriate, leaving out the 'X'.

This is easier to learn than it sounds and the documentation uses several examples to demonstrate. The program leads you through this section one step at a time, using prompts.

Polynomials are evaluated both analytically and using Simpson's Rule, and the results are displayed along with the actual difference and the percentage difference.

I entered an equation of the 20th degree and *Mathpack* solved it with Simpson's Rule in about 45 seconds and analytically in a couple of seconds, with a difference of about 0.001 percent between the two answers.

If your equation isn't a polynomial, you are asked to enter f(X). The example given in the documentation is sin(X) + exp(X). After entering the equation, you are asked for the start and end points to integrate across. This interval can be expressed as numbers or numerical expressions (e.g., 0, 2, PI, log(2), etc.).

You are then asked how many steps are to be used in the integration. I chose start:0, end:3 and 30 steps. The answer given was 21.0755411.

I checked a number of functions and found the program to be quite accurate; it was also *very* fast.

Back to polynomial expressions for a moment. This program isn't just for kidding around; you can enter a

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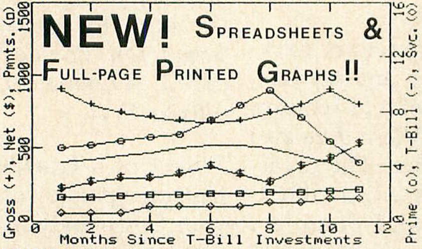

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One-Liner Contest Winner . . .

Enter the letter that appears on the screen as quickly as you can.

The listing:

```
0 CLS5:T=3000:S=0:PRINT@1,"time"
;:PRINT@21,"score";:FORA=1TO999:
L=RND(26)+64:P=RND(478)+32:PRINT
@P,CHR$(L);:FORB=1TO3001:I$=INKE
Y$:IFI$=""THENT=T-1:IFT=0THENPRI
NT@32,"";:ENDELSEPRINT@6,T;:NEXT
B ELSEIFI$=CHR$(L)THENS=S+1:PRIN
T@27,S;:NEXTA ELSENEXTB
```

Mark M. Breznai
Lorain, OH

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape*.)

polynomial expression with a maximum degree of fifty! Certainly enough to be useful.

The root finding section of the program prompts you to enter f(X) and will find 'X' such that f(X) = 0. Again you are asked for a start and end number along with how many intervals to test over the entire range. You are also asked to select a maximum error. The maximum error can be made so small that the round off of numbers will cause the program to continue forever, so this section definitely requires some knowledge and understanding of the problem.

Mathpack uses an interval-halving procedure to solve for zeros. Newton's Method is much faster but won't work with many functions, so *Mathpack*'s programmer(s) chose to go with a slower but more useful method of solving these equations.

Cartesian grapher took 50 seconds to solve x^2 + 2x + 1 and graph about 250 points between x = 0 and 100.

Cartesian, polar and parametric grapher all work about the same way. The program requests you enter the appropriate function, then asks for the range of numbers over which you want the equation graphed.

The program starts solving the equation for a large number of points and then draws a simple line graph filling the entire screen.

One nice touch I really liked was the display of a running count of the number of calculations being performed. This lets the user know the program is actually working during the wait for a solution. Since it shows a countdown, the user can also tell about how long the solution will take. You can decide at a glance whether to go for coffee, abort the solution, or just wait.

In the parametric graph section you are asked for Y(T) in addition to X(T) and also asked whether you want the Y-scale to be the same as the X-scale; otherwise, the procedure is similar for all three graph sections.

The Cartesian grapher preselects the number of intervals at 250, and the other two offer a choice of 10 to 300 steps.

Mathpack comes with seven pages of documentation that are completely adequate to instruct any calculus user in the use of this program. The final page also includes an explanation of Simpson's Rule, interval-halving and some suggestions for equations that will produce interesting graphs.

There is little onscreen help, other than the prompts, but, for all its advanced mathematics, this program is very easy to use and needs no further documentation than the few, easy-to-understand pages in the documentation.

Mathpack performs accurate numerical solutions using Simpson's Rule and does sophisticated root finding, along with performing simple graphing of complicated equations. If I were studying or teaching calculus again, I wouldn't hesitate to buy a copy of this program.

Mathpack is not a stand-alone program. You must have a copy of H.D.R. Software's *Enhancer* program ($18 U.S., disk or tape). This isn't a review of *Enhancer*, so I'll just say *Enhancer* contains a lot of nice utilities, including the lowercase driver.

In addition to *Enhancer*, *Mathpack* requires a 64K Color Computer with at least one disk drive.

(H.D.R Software, 27 Doyle Street, St. John's, Nfld., Canada A1E 2N9, $21.95)

Change Baud Rates with CoCo Kameleon

The CoCo Kameleon is a very small and compact serial-to-parallel printer interface for use with a CoCo and any parallel printer with a Centronics-compatible connector.

This unit is housed in a small plastic box with a slide switch on one side to select either 600 or 9600 Baud. Two cables extend from each end. A round cable attaches to the CoCo's RS-232 port and is five feet long, while the flat ribbon cable which attaches to the printer's Centronics connector is about 20 inches long. Hookup is a snap; just plug it in and go.

No external power is required, even when used with Epson printers. The use of low current drain electronic components enables power to be derived from the RS-232 port and the printer's data lines.

I hooked up the interface to my Gemini-10X and used it to print out a couple of program listings at both of the available Baud rate settings. The unit worked perfectly at both speeds. The CoCo defaults to 600 Baud whenever you turn it on, so if you `LLIST` a program in the 600 Baud switch setting everything works fine. If you want to print at 9600 Baud, it's a simple matter to type `POKE 150,1` and with the switch in the 9600 position everything works great.

But what about speeds between these two extremes? It is a simple task to edit most BASIC programs to use 9600 Baud by inserting the `POKE 150,1` somewhere in the beginning of the program, but what do you do if the program is in machine language? ML programs can be modified to utilize the 9600 Baud speed, but it's a lot more difficult than it is in BASIC.

I have several machine language programs with printer output speeds that are menu selectable from 600 to 2400 Baud. Luckily, my interface has a switch that allows me to select 2400 Baud, and all the others if I ever need them. I make this point only because I feel there are times when Baud rates other than 600 and 9600 will be needed. I believe the price is too high considering its limitations. The wise CoCo shopper may discover better bargains.

(Spectrum Projects, Inc., P.O. Box 21272, Woodhaven, NY 11421, $49.95 plus $3 S/H)

— Jerry Semones

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Eagle Lander is True to Life

What is an Adventurer to do? After managing thousands of nuclear power plants, averting numerous air disasters and conquering many kingdoms, what is there left to do? Conquer the moon? That's exactly the task you are given as the owner of Saguaro Software's lunar lander Simulation entitled *Eagle.*

The idea of a computer-simulated lunar landing is certainly not a new one. These simulations first appeared on computer networks that predate the CoCo by many years. The makers of *Eagle*, however, have taken the lunar lander idea quite a bit forward. *Eagle* is controlled with joysticks on the high resolution (PMODE 4) screen. The bottom portion of the screen plots the position of the craft, providing a graphics representation of the craft in flight. Meanwhile, the top portion of the screen provides the pilot with a host of instrumentation which reports such important data as relative position, altitude, horizontal and vertical airspeed, acceleration, percentage of rocket thrust, fuel remaining and time elapsed. All these indicators help the would-be pilot appreciate the difficulties involved in managing such a complex operation as a moonshot.

The complexity increases as the craft approaches one of the two possible landing sites. Both horizontal and vertical airspeed must be brought down to near zero precisely when the craft is located in the proper position. This is an extremely difficult task, which requires many trials to achieve reasonable adeptness. To make life more dangerous, the user can "play damage control" by choosing the advanced difficulty level. It introduces such emergencies as fuel leaks, maneuvering problems and computer screen failures. These malfunctions provide extra challenges and require greater mastery of the craft's abilities to perform a successful landing.

Other operational commands allow the user to adjust the attitude window for fine or coarse control of direction (a very important feature when trying to land), perform a fuel dump and predict future position based on present course and speed values. Using the latter command, the user may jump ahead in time and accept the predicted values and position just as if he had maintained the course for the prescribed time. All these functions add greatly to the playability of the Simulation (not to mention saving the keyboard from frustrated thrashings).

Despite *Eagle*'s complex nature, the user manual provides excellent insight and interpretation of the physics involved in an actual lunar landing and how the user can apply these to his advantage. The manual also accurately describes the command structure and flow of the game. The documentation is complete in every respect, including a guarantee to replace defective disks unloadable by the original owner.

The author of *Eagle*, Art Martin, has done an excellent job in producing a realistic Simulation of a lunar landing. The Simulation is so true to life, in fact, a certain sense of "harsh reality" is incorporated into the program. This is not an easy-to-master Simulation, rather, it's a reflection of a technologically advanced procedure and requires considerable practice to perform a successful landing. Therefore, this program is excellent for hardened game players who are looking for a considerable software challenge which won't sit on the shelf after the first few successful landings.

(Saguaro Software, P.O. Box 1864, Telluride, CO 81435, $24.95 tape, $29.95 disk, requires 32K and two joysticks)

— Eric Oberle

TV DINNERS
CoCo DINNERS
BLACKWELL ©

One-Liner Contest Winner . . .

According to Francois, rain is rare in Australia so he wrote this program to remind his children of what it looks and sounds like.

The listing:

```
0 PCLEAR8:FORS=1TO8:PMODE0,S:PCL
S:FORR=1TO10STEP2:CIRCLE(126,94)
,R*S:NEXTR,S:FORK=1TO10000:FORI=
1TO4:POKE140,100+RND(150):EXEC43
345:PMODE4,I:SCREEN1,1:FORJ=1TOR
ND(50):NEXTJ,I,K
```

Francois Bolle
Australia

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape.*)

Improve Reading Skills with *Alphabetizing*

When I received this program for review, it was obvious that it was aimed at two distinct markets — concerned parents and school systems. I am one of those two markets. I have two children, one too old for the product. What to do? I asked David (age 10) for help, and in true Tom Sawyer fashion he soon had every neighborhood child from age 3 through second grade lined up for user testing of the program with himself as teacher. This review is a combined effort by him and his 4-year-old sister, with occasional comments by Dad.

The catalog from Aquarius which came with this program mentions that it won the Topp Award, which implies a lot of respect for this approach within the educational establishment. This catalog also shows that the program is available on many other computers, and indicates this firm has an entire line of programs for nursery school through high school or college.

The package includes a good set of teacher aid samples in a well-made ring binder. Any certified teacher would know all they needed to use the package except how to start the program on the computer. The program is in BASIC and that is not a major problem, but it did frustrate our young teacher.

Alphabetizing, The Pathway to Reading uses random number generation to provide a new set of test material each run. At each run and at each level, the student indicates whether things are in correct alphabetical order. Sometimes a missing letter must be filled in, sometimes the letter before or after the letter shown must be stated. Sometimes a group of words is shown, and you must put them in order. There are many different games, each of which requires alphabetizing. Some of these were a lot of fun, others were just normal school drills.

The right answer gets a rainbow drawn on the screen, but a wrong answer gets a rain cloud. Lizzie (age 4), got bored more rapidly than with her Sesame Street programs. But she said to be sure to mention that she liked the game in which Snoopy lies on his dog house while she picks out letters.

Our friends who came to help test this program enjoyed it and seemed to pick up speed as they used it.

Dad had to run the printer. The program let me test the kids and then print out their answers. If I were a real teacher that would be a help. With only a few kids it isn't really needed, but it did make the kids feel like they had used an important program. One of them even took his test score home.

This program is probably better suited for the school than the home because there is only a relatively short time span (one or two years) when the child is at just the right stage of development for the program. Earlier, the child gets distracted. Later, the child gets bored. That is probably a problem with most educational software, but it emphasizes why the program is better off in the school than in the home in this instance.

Note that this criticism does not detract from the effort by Aquarius to have many different games at varying levels of difficulty in one program. The varying levels of difficulty, all built around drills that improve reading skills through alphabetizing, can probably be made very effective in the classroom.

(Aquarius People Materials, Inc., P.O. Box 128, Indian Rocks Beach, FL 33535, $69)

— Elizabeth and David Elman

One-Liner Contest Winner . . .

This one creates a moving sine wave by drawing eight pictures in different graphics areas..

The listing:

```
63999 CLS5:PCLEAR8:FORA=1TO8:PMO
DE0,A:PCLS:FORB=2TO252STEP2:LINE
(B,96-84*SIN((B*45/32+A*45)/57.3
))-(B,188),PSET:NEXTB:SCREEN1,0:
NEXTA:FORA=0TO1E38:PMODE0,(7ANDA
)+1:SCREEN1,1:C=C+4:SOUND128+127
*SIN(C/57.3),1:IFINKEY$<>" "THEN
NEXTA ELSECLS:END
```

Walter Pullen
Kent, WA

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape*.)

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Wico Command Control Trackball Takes the Punishment

There must be an easier way to get a better score without causing serious harm to your trusty CoCo. We all tend to get carried away during the heat of battle, and this excitement is often transferred into "white knuckle" treatment of some relatively fragile plastic parts.

It's only human nature to get excited during competition. Have you ever noticed that many commercial arcade games use a trackball control instead of a joystick? The action at these arcades often got so intense, the manufacturers had to find a more reliable alternative. Well, that alternative is available for the CoCo in the form of the Wico Command Control Trackball.

This device replaces your joystick and is very rugged. It measures 5 by 6 by 1⅞ inches and weighs a little over one pound. It uses, of all things, a billiard ball as the primary user interface. A firebutton is located at the upper left corner on top so it's easy to get to with your left thumb. If you want to put it on your computer table, it won't slide around easily because it has flat rubber feet on the bottom. It does require a separate power source, which is included in the form of a plug-in wall transformer. The other cable terminates in a standard five-pin DIN plug to fit the CoCo joystick connector.

Operation is simple. You get full 360 degree movement by just moving the ball with fingers or palm. It's easy to use and allows controlled movement by simply moving the ball fast or slow. It's a unique feeling and one you have to experience to fully appreciate. I tried it on several games and was able to get higher scores than I could with my joystick. I also used it with *CoCo Max* and liked the smooth feel and easy positioning of the cursor. The only drawback I noticed on *CoCo Max* was it took longer to go from the workspace to the menu due to the vernier action of the device.

The device boasts the use of a microprocessor control circuit using photosensors and a built-in analog-to-digital convertor with an eight-bit output. Since the CoCo only has a six-bit joystick port, that probably explains some slight positioning errors with programs like *CoCo Max*. Wico is aware of this problem and even discusses it in the instruction booklet.

This device is best suited for CoCo games, although it will most certainly provide excellent service in other programs normally requiring a joystick.

Wico guarantees the Command Control for one year which attests to its durability. This device can take all the punishment you can give it — so bring on the Klingons!

(Spectrum Projects, Inc., P.O. Box 21272, Woodhaven, NY 11421, $19.95 plus $3 S/H)

— Jerry Semones

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Casper CoCo Quick Assembler: Ideal for Beginners

Casper CoCo Quick Assembler is a fast combination of monitor, editor, assembler and debugger. To get this extra speed, the editor looks up the symbols and opcodes and saves indexes into tables instead of characters. The program comes with both a 32K version and a 64K version. The 64K version places the machine language portion of the program and your source code file in high RAM leaving most of low RAM for your machine language program. I like this program but there is good news and bad news.

First the good news. This is a delightful program. It is easy to learn and easy to use, ideal for a beginner. The BASIC loader boots the system and sets certain parameters. From this portion of the program you can save and load source code files and machine language files. The program can create its own backup copy onto a blank disk. From this part of the program simply press 'M' to go to the monitor.

The monitor-debugger is also the command level. It is here you perform most operations. You can examine and change memory, assemble source code, print out source code or object code, set up to eight breakpoints, search up or down through source code for a target string, execute machine code and view the registers as you go. You can scroll up or down through the source file line by line. Numbers can be displayed in hexadecimal or decimal.

The screen used by the program is different from the text screen. You can view the usual text screen at any time. Block move, block copy, block delete and block print can be performed on the source file. You can ask for the number of the line you are in, and you can jump to any line in the source file by entering the appropriate line number. When executing machine code, you can walk through the program one line at a time, a number of lines at a time, or execute until you reach a breakpoint or a certain number of breakpoints.

The editor is where you type in the source code. You can edit, insert and delete lines of code or simply scroll up or down one line at a time. If you enter an improper opcode or an obvious syntax error, the program alerts you with a beep.

The assembler is activated from the monitor. If an error is encountered, the monitor jumps to the problem line for debugging.

Now for the bad news. I had a lot of trouble booting this program. On my old (gray) 'D' board 64K CoCo I get an error message. Typing `RUN` over again solves the problem for this old CoCo. On the newer (white) 64K CoCo 2 the computer hangs up completely. I managed to get the 32K version to run on the 64K CoCo 2 by resetting the computer and then typing `RUN` again. I suspect that this is a minor problem with the BASIC loader and may be corrected in future versions.

Another problem in the BASIC loader is the printer Baud rate. The manual suggests that you can set the Baud rate in Line 50 of the loader. After having some trouble with the printer, I discovered that the Baud rate had already been set at 9600, (easy enough to fix once found).

The manual is not clear enough in explaining how to save machine code once it has been assembled. Also unexplained is the Load command. This command lets you load machine language into memory. However, there seems to be no way to access it. The program deals only with source code and machine code that has just been assembled from source code, not machine language files. There is no disassembler in this program. This means that you cannot examine machine language portions of memory (such as the basic ROM) in terms of assembly language. Advanced users may find this a drawback.

Except for the bugs I have mentioned, however, this is a good program and has a reasonable price.

(Earl W. Casper, 6012 S. 14 Place, Phoenix, AZ 85040, $20)

— James Ventling

Two-Liner Contest Winner . . .

And they're off! Pick a horse to win out of a field of seven. If you press ENTER when they are at the line, the horses will run. You and your friends can then pick the horse you want.

The listing:

```
0 POKE65495,0:DIMH(20,20):PMODE3
,1:PCLS:DRAW"BM100,99U8R10U6R8D4
L2D10L4U3L8D3L4":GET(90,83)-(121
,101),H,G:PCLS:SCREEN1,0:FORX=1T
O191STEP27:PUT(0,X)-(31,X+18),H,
PSET:U=U+1:P(U)=X:NEXTX:DRAW"C3"
:LINE(240,0)-(255,191),PSET,BF:E
XEC44539:PLAY"O3L18CL4F"
```

```
1 FORX=1TO7:M(X)=M(X)+RND(10):PU
T(M(X),P(X))-(M(X)+31,P(X)+18),H
,PSET:IFPPOINT(M(X)+33,P(X)+9)<>
1THENPLAY"O3L115CDDEFFGAAB":FORT
=1TO10:PUT(M(X),P(X))-(M(X)+31,P
(X)+18),H,PRESET:PUT(M(X),P(X))-
(M(X)+31,P(X)+18),H,PSET:NEXTT:E
XEC44539:RUNELSENEXTX:GOTO1
```

Mike Cooney
Mansfield, OH

(For this winning two-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape*.)

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Analyze Perceptions with *Psycho I*

In spite of the name, you don't have to be afraid to use *Psycho I*. Using a loose interpretation, this program could be called a game, but it has more possiblities than being just a game. In a school setting it would be a fun way for school psychologists to learn more about the perceptions of their students. I had an enjoyable time going through the programs and seeing my reaction time or accuracy in remembering shapes.

The collection of programs sold as *Psycho I* is a series of eight programs created as classical exercises for the psychological laboratory. The programs are *Illusion*, which measures the strength of three illusions (Muller-Lyer, Opel-Kundt, Helmholtz); *Observer*, which are exercises to test observation skills; *Reaction*, which measures visual and auditory stimuli; *Pyramide*, where you find the solution to a pyramid puzzle by trial and error; *Series*, where you find, by logic, the permutations of five numbers; *Memoire*, in which you memorize numbers and letters; *Optiques*, where you draw impossible and reversible figures on the screen; and *Fechner*, for drawing G.T. Fechner's picture on paper.

The program and documentation are written in three languages: French, Spanish and English. You choose which language to use when first starting the program. Each of the programs is self-explanatory, giving plenty of information in order to run the program and to interpret its results. The BREAK key has been disabled, so in order to get out of programs, press the slash (/) key. You could also press the Reset key, which gives a warm start and returns you to BASIC.

The directions and helps are easy to understand, except in the back of the manual where each program is explained. There, things are explained in each language, but it is not organized to differentiate between the languages, and it took me a while to see that the explanations started in French, then were in Spanish, with the last lines in English. The English documentation in the manual and the explanations and instructions in the program were filled with spelling errors. They were not the kind that made things hard to understand, but were an annoyance.

The programs are well-done and interesting, as well as useful in determining children's aptitudes for abstract thought. The graphics and layout of the programs were excellent. I think the tests or exercises would be fun for children. Since so many standardized tests have sections for abstract thought, these programs may even be useful to familiarize children with this type of thinking activity.

(Lomiq, c p 105, Succursale A, Jonquiere, Quebec, Canada G7X 7V8, 64K required, one disk, $34 U.S., $45 Can.)

— Thomas E. Nedreberg

Innovative *Plateau of the Past* is a Swashbuckler

After many years and many Adventures, it would take something uncommon to really stir my interest. Not just another dragon to slay, another cave to explore, another 300K monstrosity, but . . . well, something different that could really offer an interesting challenge. Something new.

Enter *Plateau of the Past* — just the thing to whet your whip-cracking appetite.

Almost as soon as you begin *Plateau*, you will be reminded of Indiana Jones. Rather than a classic text or a modern graphics Adventure alone, this Adventure combines a little of both. A dash of animation and a separate fight screen help add to the challenge and the difference of *Plateau*. This is not an easy Adventure to solve! One nice feature of this program is that authors Chuck Jager and Jim O'Keefe have waxed philosophical, and the text and gravestones have interesting sayings. Death, my dear fellow Adventurers, is no longer boring!

The program is composed of three major components plus start-up routines and so forth. They are the text window, generally the lower half of the screen, and the map window, a Hi-Res 2-inch by 2-inch area in the upper center of the screen. The map window reads like a map from above, but displays the moves of the characters in the Adventure, as well as your progress, major events and confronted meanies. The third screen is the fight screen. It pits you against the enemies, displays your and their attributes and describes the fights with blow-by-blow descriptions. Fights are resolved when one side's stamina has dropped to zero.

Several things make the game smoother and more enjoyable. These include the compass that charts your progress; being able to check your ability, stamina and luck; selecting and reviewing your weapons; and even the opportunity to eat. The documentation is well-written and clear and tells you all you need to know. The rest is up to you and fate, because luck plays a large part in *Plateau of the Past*.

Good as it is, I found several drawbacks to *Plateau*. First, there is no game-save feature. It could be argued that one is not necessary, however, a save routine would have been a nice extra. Second, you must restart the entire Adventure each time you die. This is tedious, and a shortcut (save routine) would have come in handy. Third, the fight routines, while being creative and well-represented, are somewhat reminiscent of the sound effects portrayed on-screen in the *Batman* television series. Substituting graphics here instead of words would make worlds of difference. A slightly larger map window would have been better, too.

All of these are minor points, however, when considering this extremely well-written, well-presented, innovative Adventure program. *Plateau of the Past* is a good, rollicking swashbuckler of an Adventure to keep even Indiana Jones proteges happy for a long time!

(Zytek, Ltd., P.O. Box 701, Blue Island, IL 60406, 32K disk only $26.95 plus $2 S/H)

— Jeffrey S. Parker

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A Winner — *Hall of the King II: The Inner Chamber*

Prickly-Pear Software has come up with another winner for CoCo Adventure addicts. Sequels seem to be the "in" thing lately, and Glen Dahlgren has created a very good one. *Hall of the King II: The Inner Chamber* begins another quest for the legendary Earthstone. You do not need to be familiar with the original *Hall of the King*, but after going through these two disks you may want to check out the original.

Yes, this is another two-disk graphics Adventure. The detail in the graphics is very well done. Be ready to make a detailed map of the many areas of the Adventure; you'll need it. The difficulty level is intermediate leaning toward advanced, mainly due to the length of the Adventure. You should plan on being tied up for a while with the CoCo. It is often hard to review an Adventure without giving away the best parts. Do not overlook *anything*. All I will say is that there is a clue in the first paragraph of this review.

No matter how good an Adventure, or any program, there is always someone who thinks it can be improved. The game has a save and load feature, but it will only save one game at a time. There is a way to get around this, but I would like to see a multigame save feature, if there is room on the disks. The only way to save more than one game is to back up the disks and save different games on different disks.

The Adventure requires 64K and one or two disk drives. I have two drives, but found I liked to know which disk was being used, so I used only one drive. If you have double-sided drives configured so that each side is accessed as a different drive, you can back up each game disk to opposite sides of one working disk. Prickly-Pear suggests you only use the backups and store the originals in a safe place.

While the documentation is not extensive, it is adequate. Like most other Adventures, all you need is a little information to start. You get all the rest from the Adventure itself. The packaging is standard for Prickly-Pear, with a vinyl container giving a compact, safe place to store the original. This is the third two-disk Adventure from Prickly-Pear, and while I have not seen *Hall of the King*, I know the other two are very well-done. With this type of software and support, the CoCo will be around for a long time.

(Prickly-Pear Software, 2640 N. Conestoga Ave., Tucson, AZ 85749, two disks $39.95 plus $1.50 S/H)

— Dale Shell

See You at
RAINBOWfest-Princeton
October 17-19

Bowling League Secretary Makes Calculating Stats Easy

Aside from the computer hobbyist, most of us buy computers to ease the chores of modern living. One such chore is the collection and maintenance of data associated with a particular function such as a club roster. However, the standard database programs are not always easily adapted to the chore to be done — in this case the data management of one of America's favorite pastimes, bowling.

With the introduction of *Bowling League Secretary* from Tomela*Co, we should soon see CoCos popping up all over bowling land. Will it take over the local bowling alley? Maybe not. But at least the poor bowling league secretary, who spends many hours each week calculating team standings and other bowling statistics, will now have more time for other things.

When *Bowling League Secretary* arrived for review, I was somewhat hesitant to do the review since I am not a bowler. But, this program is just a very specialized database manager. Having had considerable experience with database programs, all I needed was the "technical" know-how of what a bowling league secretary does. As it turns out, my boss is a real bowling aficionado who has served several years as secretary for a local bowling league. He was quite impressed with this BASIC program which keeps track of all bowling records for a league.

Bowling League Secretary is a well-organized menu-driven program with very good documentation. The program is almost self-documenting, with many screens describing what is expected from the user. Using the program is easy because it follows a very logical progression. You start by defining the league, then each team in the league and finally the members of each team. In addition, information such as the number of games per night, and the number of blinds and handicaps allowed by the league are to be entered. Once this information has been entered, you are ready for the bowling season!

Each week, the league secretary must record the scores for each player for the number of games played that night. When all of the scores are entered, the CoCo takes over and produces five weekly reports. The first is weekly scores by player which lists all bowlers alphabetically, and shows the current week's scores for the three-game series and the average for the night, as well as a summary of the season to date of high game, high series, total pins, and cumulative average.

The second report is a team standings and high scores summary report which shows team standings, individual high scores and team high scores. The individual high scores section of the report shows the average, high game and high series for the leading player of each team. The team high scores section shows high game and high series for each team. The individual averages report lists, by team, the cumulative game average and total pins for all players in the league. The team data listing report shows, for the team, total pins for each game played in the evening as well as high game, high series, and total pins. The player data listing is an alphabetical listing of players showing total games played, total pins, game average, high game and high series.

The preparation of these reports takes many hours of work when done by hand, even with a calculator. With *Bowling League Secretary* and a CoCo you end up with a weekly set of reports neatly printed in much less time.

One particularly nice feature of the program is what the author refers to as disaster recovery. It maintains a backup feature that contains the final results for the previous week. If you happen to do something wrong while entering the new data, or have a power failure, etc., select disaster recovery and you'll have all the data back except for the current week. This is an excellent feature.

Bowling League Secretary is a well-planned program which does what it was designed to do. As with any piece of software, there are areas for improvement. Unless I have missed something, my expert claims there is one very important report it does not produce. It is my understanding that the league secretary prepares, at the end of a season, a final tally sheet for each player. This report contains all of the scores accumulated each week by the player and gives a final cumulative game average, high game and high series. Such a report should be added to the program.

The reporting capability is nicely done. The author has taken the time to produce neat and attractive reports. However, these reports are designed for a Gemini 10X printer and make use of special features of the Gemini using CHR$ codes. The codes would not work on my printer. Fortunately, the author provides an appendix that documents all of the BASIC lines containing printer codes. Those with different printers will have to change these codes. In my case, I simply removed all of the codes and had no problem.

I would strongly recommend *Bowling League Secretary* to all those volunteer league secretaries who maintain league records.

(Tomela*Co, P.O. Box 2162, Doylestown, PA 18901, $49.95 disk only)

— Donald D. Dollberg

One-Liner Contest Winner . . .

Enter a message and use the space bar to stop and start it as it scrolls across the screen. When stopped, its `PRINT@` location will be in the upper-right corner of the screen.

The listing:

```
10 CLS:INPUT"ENTER PHRASE";A$:FO
RX=1TO480:Y=X:CLS:PRINT@X,A$;:FO
RZ=1TO100:NEXTZ:IFINKEY$=" "GOTO
20 ELSE IF X>=480 THEN X=1 ELSE
NEXT X
20 PRINT@27,Y:IF INKEY$<>" "THEN
 GOTO20 ELSE NEXTX
```

Daniel Bisbee
Chesterfield, MA

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape*.)

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HI-RES II is the most powerful screen enhancement package available for the Color Computer, yet it is the least expensive. It is completely compatible and transparent to Basic. Once the program is loaded, everything works the same as before, only you have a much better display to work with. It even allows you to have mixed text and Hi-resolution graphics on the same screen or have separate text and graphics screens. It also has an adjustable automatic key repeat feature and allows you to protect up to 23 lines on the screen. HI-RES II features over 30 special control code functions that allow you to change characters per line, protect display lines, change background color, position cursor, switch normal/reverse video, underline, double size characters, erase line/screen/to end of screen, home cursor, character highlight and much more. It works on all models of the CoCo with 16, 32 or 64K and provides automatic reset control so HI-RES II won't disappear when you press reset.

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The Editor in EDT/ASM 64D is the most powerfull, easy to use Text Editor available in any Editor/Assembler package for the Color Computer. It even has automatic line number generation for easy entry of program material. Some of it's features include:

- Local and Global string search and/or replace.
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- Supports the PBJ 80 Column cards Word-Pak I & II.

The Assembler portion of EDT/ASM 64D is the part that creates the Machine Language program. It processes the source file(s) created or edited by the text editor and creates a LOADM or CLOADM binary file on either Disk or Tape. Using library files you can assemble an unlimited size file, using several different disk drives.

- Supports conditional IF/THEN/ELSE assembly.
- Supports Disk Library files (include).
- Supports standard motorola assembler directives
- Allows multiple values for FDB & FCB directives.
- Generates listings to Hi-Res text screen or printer.
- Assembles directly to disk or tape in LOADM format.
- Supports up to 9 open disk files during assembly.
- Allows assembly from editor buffer, Disk or both.
- Full description text error messages.

DEBUG is a free standing program debugger which provides all the functions supported by most system monitors. Some of them include:

- Examine and change the contents of memory.
- Set and display up to 10 breakpoints in memory.
- Remove single or multiple breakpoints.
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- REVERSE CHARACTER HIGHLIGHT MODE
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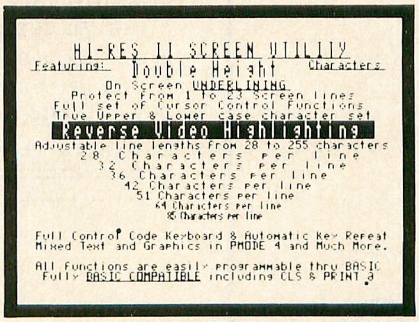

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32 Characters per line
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Screen Enhancement Program Comparison Chart

PROGRAM FEATURES	HI-RES II NEW	HI-RES I OLD	BRAND X
Upper/Lower case characters	Yes	Yes	Yes
Mixed Text and Graphics	Yes	Yes	Yes
Separate Text & Graphics	Yes	Yes	No
Print @ fully implemented	Yes	Yes	Yes
Print @ on all line lengths	Yes	Yes	51 only
Different line lengths	28 to 255 (9)	28 to 255 (9)	51 only (1)
Automatic Key Repeat	Yes	Yes	Yes
Adjustable Key Repeat	Yes	No	No
Auto Repeat Disable	Yes	No	No
Erase to end of line/screen	Yes	Yes	Yes
Home Cursor	Yes	Yes	Yes
Solid or Blinking Cursor	Yes	No	Yes
CLS command supported	Buff/Biack	Buff/Black	Buff/Black
X.Y Coordinate Cursor Positioning	Yes	Yes	No
Double Size Characters	Yes	Yes	No
Individual/Continuous Highlighting	Yes	Yes	No
On Screen Underlining	Yes	Yes	No
Clear Key functional	Clear/L keys	Clear key	No
16.32 & 64K Supported	Yes	Yes	Yes
Green or Black Background Color	Yes	No	No
Dual Character sets for Enhanced 64 and 85 Characters per line display	Yes	No	No
Protected Screen Lines (programmable)	1 to 23	No	No
Full Control Code Keyboard for Screen control directly from the keyboard	Yes	No	No
Programmable Tab Character Spacing	Yes	No	No
Full Screen Reverse Function	Yes	Yes	No
Switch to & from the Standard 16 by 32 Screen for full compatability	Yes	No	No
On Error Goto Function	No	No	Yes
Extended Basic Required	No	Yes	Yes
All Machine Language Program	Yes	Yes	Yes
RAM Required in addition to Screen RAM	2K	2K	2K
Program Price (Tape)	$24 95	$19 95	$29 95

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Memory Minder: Insurance Against Costly Repairs

By Dale Shell

J & M has supported our CoCo in the past and is continuing with its new and improved disk controller, a nicely packaged disk drive and *Memory Minder*, a disk drive test program. All three products interlink and are very good.

The new disk controller is well made, with J & M's standard metal case and gold contacts on the circuit board. It is compatible with both the original CoCo and the new CoCo 2s. The new features include a parallel port which supports either a Centronics compatible printer or J & M's new hard drive. Another new feature is an external ROM switch, which allows switching between two ROM (DOS) chips. The controller comes with the new version of JDOS and the associated manual. The new JDOS comes on a 27128, 16K EPROM. This is a 28-pin chip. This socket also accepts a 2764, 28-pin EPROM. The other socket inside the controller accepts the standard 24-pin chip. This can be a Radio Shack Disk BASIC ROM, a 68766 or 68764 EPROM.

Therefore, you can have two DOSs installed and can switch between the two. While the new JDOS is much more compatible with existing software, this switch allows the use of a Radio Shack DOS in the second socket, thereby eliminating all compatibility problems. If you want to, you can replace the JDOS chip with a DOS burned into a 27128 or 2764 EPROM. With both sockets available and the ability to use either 2764s or 27128s in one of the sockets, this really leaves open a host of options. The new JDOS includes all the older JDOS commands plus the ability to boot OS-9 from either a floppy disk or a hard drive. It can also boot *Memory Minder*, the disk drive analysis program, but more on that option later.

The parallel port can be used for either a printer or hard drive. At this time, J & M has the five meg and 10 meg drives available, with the 20 meg promised by the time this review is published. The hard drives work with OS-9. The hard drive memory can be broken up into as many as seven partitions, but none can be larger than five meg.

The printer option allows the use of the serial port for other purposes, but it does have a few drawbacks. First, it does not come with a printer cable. Secondly, if you have a printer that requires a pulse width of six ms or larger, you will have to use a pulse extender. This can be purchased from J & M for $25. You need to check your printer manual and/or call J&M to find out. Some of the printers that need the extender include the Epson RX-80, Riteman Plus, Oxidata Microline 83, and all Olivetti printers.

You can get the new JDOS controller alone or with a drive system. The drive system includes the new JFD-CP disk controller, complete with the new version of JDOS operating system, and a drive with case and power supply. The options include either a single- or double-sided drive. I really like the horizontal mounting that J & M uses, and the case seems to be very sturdy.

With JDOS, using double-sided drives, the smallest program takes up the equivalent of two granules. There is really very little that can be said about disk drives. J & M's have well-built cases and they are reasonably quiet.

The last part of this trio is the *Memory Minder*. With this you are presented with a menu for clamping test, spindle speed test, index hole timing test, alignment sensitivity test, head alignment test, directional seek test, head rotation test, a special quick test and options for an analog alignment aid or change test parameters.

The test provides a quick summary indication of your disk drives for all the tests listed. Once this test is started, it runs to completion. On each of the seven tests you will get either a pass, marginal or fail indication for that test. If you get a marginal or fail, you should test that section more closely, or have it tested by a qualified technician.

A word of warning, however: If you find an error and

BASIC COMPILER

WASATCHWARE believes that users of the Color Computer deserve the right to use all 64k of RAM that is available in the computer, and have fast machine language programs that use the full potential of the 6809 microprocessor. That is why the BASIC compiler, called MLBASIC was developed. Here are some of the reasons that make this compiler one of the best bargains in this magazine:

- Use all 64k of RAM for program storage and/or variables
- Full Floating Point arithmetic expressions with functions
- Full sequential and direct access disk files allowed
- BASIC source and M.L. output I/O to disk, tape or memory
- Many new commands that expand your programming capability

Commands Supported

1. I/O -Commands
CLOSE CLOADM CSAVEM DIR DRIVE DSKI$ DSKO$ FIELD FILES
GET INPUT KILL LSET OPEN PRINT PUT RSET USING

2. Program Control Commands
CALL END EXEC FOR STEP NEXT GOSUB GOTO IF
THEN ELSE ERROR ON..GO RETURN STOP SUBROUTINE

3. Math Functions
ABS ASC ATN COS CVN EOF EXP FIX INSTR
INT LEN LOG LOC LOF PEEK POINT PPOINT RND
SGN SIN SQR TAN TIMER VAL

4. String Functions
CHR$ INKEY$ LEFT$ MID$ MKN$ RIGHT$ STR$ STRING$

5. Graphic/Sound Commands
COLOR CLS CIRCLE DRAW LINE PAINT PCLEAR PCLS PLAY
PMODE PRESET PSET RESET SCREEN SET SOUND

6. Other/Special Commands
DATA DIM LLIST MOTOR POKE READ REM RESTORE RUN
TAB VERIFY DLD DST IBSHFT LREG PCOPY PMODD PTV
REAL SREG SWP VECTD VECTI

Compiled Program Speed (Time in minutes:seconds)

Program	Interpreter	MLBASIC
Eratosthenes Sieve	6:58.7	0:06.3
Matrix Fill,Mult,Sum 10x10	0:30.9	0:02.5
String Manipulation	6:22.5	2:17.7
Floating Point	0:32.6	0:30.6
Disk I/O (2000 PRINT/INPUTs)	2:21.5	0:27.6

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you are not technically familiar with the hardware, I suggest you get expert advice before adjusting anything, since you may make it worse. Some test conditions are affected by other factors and not just the one that is being tested. As in the clamping test, the quality of diskette clamping is normally a function of how well the diskette is rotating in a circle, but if the drive is out of alignment, the clamping test results may be meaningless. Make sure you read all the notes in the DDA manual. If you do get a fail on the clamping test and the diskette is not the problem, then the problem should be referred to the manufacturer.

The spindle speed test measures the rotational speed of the disk drive. The speed should be between 294-306 RPMs. If you have a disk drive manual, this should be easy to adjust. Just remember, if you have not done this before, be careful. The next test, the index hole timing test, measures the time difference between the leading edge of the index hole and the beginning of the sector ID mark. Ideally, the time will be 200 microseconds, but can be in the range of 100-300 ms. This is a fairly large margin, but if the timing is out, the DDA manual gives the procedure for adjustment.

Another feature of the test allows you to determine the skew of the head. This is to determine if the head is perpendicular to the disk surface. To do this test, just compare the difference of hole timing from the inside and outside tracks. This is not something you can adjust, so let us hope it is OK. If the head skew is out, you will have to return the drive for refurbishment.

The alignment sensitivity and head alignment tests are used during head alignment. The alignment sensitivity test relates to how tolerant the drives will be to a slight head misalignment.

The directional seek test gives a measurement of how precisely the drives can repeatedly position the head over any track on the disk. The test measures the radial alignment when the head is moved in to a test track and then when it is moved out of the test track. The two measurements are compared; any discrepancies are probably due to hysteresis, and if excessive, the drive should be refurbished.

The last test is the head rotation test. This test determines how close to the center line of the tracks the head moves. The optimum alignment will have the head center line parallel to the track tangent line.

The analog alignment aid is not a test, but is very useful if you are testing drives in the traditional manner using an oscilloscope and an analog alignment disk. This section allows you to start and stop the drive motor, and position the drive head. There is very little that is automatic. This is useful to the more experienced.

Overall, I think the DDA is a good product to have around. A technician can use it in his day-to-day work and the casual user can periodically check the different parameters of the drives to see if a technician is needed. Early detection of a problem can reduce or eliminate costly repairs.

The price varies according to what controller you have, but $59 for single-sided and $75 for double-sided drives can be thought of as insurance against repairs in the future.

(J & M Systems Ltd., 15100-A Central SE, Albuquerque, NM 87123, Drive 0 (SS) $279, controller $139, *Memory Minder* (SS) $59, (SS or DS) $75)

Get a Kick from *Karate*

Karate is a game for either one or two players requiring a 64K ECB Color Computer and joysticks. The software is available on either disk or tape, and is copy protected.

After loading the program, you are greeted with a color test screen. Here you are given the opportunity to correct the color by resetting the computer. The main title screen follows and has spaces to list the top 10 scores. After selecting either one or two players, you are ready for action.

The object of *Karate* is to knock down your opponent using various karate moves, kicks and punches to score points. Your points are displayed at the top left of the screen. In a two-player game, the first player to win two matches is the winner. The number of matches won for each player is displayed at the bottom of the screen. In the one-player matches the opponent is the computer.

Action is controlled by the joystick(s) and the following karate moves are possible: low kick (trip), forward kick to body, backward kick to body, front punch to head, front punch to body, front kick to head, backward kick to head and drop kick. In addition to these moves, your man can do either forward or backward flips. The moves and punches appear authentic. Obviously the programmer, Dave Dies, knows something about this popular Oriental sport.

The graphics are really outstanding, and unique sounds are used with the score screen. One man has a blue belt and hair, while the other has a red belt and hair.

My only complaint, after learning that the software is copy protected, is that no mention is made in either the documentation or the RAINBOW ads about a warranty. Certainly the author has a right to protect his software, but he should also tell the customer what can be done in the event a problem develops with the program.

If you are into karate, you will get a kick out of this program. But even if you're not, you will find it an interesting game and a pleasant diversion from typical computer fare.

(Diecom Products, 8715 Fifth Line, Milton, Ontario, Canada L9T 2X8, tape or disk $28.95 U.S., $38.95 Can. plus $2 S/H)

— Jerry Semones

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OS-9 Utilities Give Added Power to OS-9

One of the nicest things about OS-9 is you are not limited to the utilities that come with the package. The Other Guy's Software is offering a package with some interesting and useful utilities you just might want to try.

I received *OS-9 Utilities* on a disk setup in the popular style having the programs located in their own subdirectory called /cmds. The utilities supplied in the package are: *Bmode*, changes parameters on random block file managers (i.e., disk drives); *Calc*, a scientific calculator with memory; *Cat*, lists files to the standard output; *Cptree*, copies all of one directory (including any subdirectories) to another directory; *CP*, copies one file to another file; *Crypt*, encrypts/decrypts files; *FRS*, reads a Radio Shack DOS text file under OS-9; *Grep*, a patterned search routine; *Hcalc*, a hexadecimal calculator; *Help*, provides help on a user-specified topic; *Locate*, locates all occurrences of a specified filename in a specified directory (includes all of its subdirectories); *Lower*, changes all uppercase letters in a specified file to lowercase letters; *Mkdir*, makes directories; *MV*, moves files from one place to another, deleting the old file as it writes the new one; *RM*, deletes a specified file or files; *Split*, splits one file into several files of specified lengths; *TF*, formats text for display or printing; *TRS*, writes an OS-9 file on a Radio Shack DOS disk; *Upper*, changes all occurrences of lowercase letters to uppercase letters in a specified file; *Rsdir*, reads the directory of a Radio Shack DOS disk under OS-9.

In addition to these twenty utilities, the package also contains three devices. They are MEM, a RAM disk; NUL, a null device; QUE, a device for ordering command processing

I am not familiar with OS-9 packaged for applications other than the Color Computer. Some of the utilities included in the package duplicate utilities that come with CoCo OS-9 packages. These are *RM*, which seems to be the same as the OS-9 DEL command, *CAT*, which seems to be the same as the OS-9 LIST command, and MKDIR, which does the same job as the OS-9 *MAKDIR* command.

All of the utilities ran without a hitch, except *Bmode*, which the documentation warns will probably not work with the standard CoCo OS-9 drivers.

It would be hard to pick one utility over the others. I liked several of them. The ones I would use most often would be *Cptree* to copy all the files in a /cmds directory, and *MV*, which allows you to move a file from one place to another, deleting the file from its former position as it copies it to its new position.

The only minus mark for this package is for the documentation. The package comes with almost no documentation and the user is expected to get instructions from the Help files. The package does come with a three-page photocopy of the installation instructions. I solved the problem of documentation by loading *List* into memory and then listing each of the Help files to the printer. This gave me a pretty respectable set of instructions.

An unfortunate fact of CoCo OS-9 life is a shortage of both disk and memory space. For this reason I would suggest that a new purchaser of this package load each of these utilities into memory one at a time and then execute them to evaluate whether they deserve a spot in the /cmds directory or not. I believe you will find a spot for at least one or two.

Of the four qualities I look for in a utility — ease of use, usefulness, relative freedom from bugs and value for the price — this package qualifies on all four. I have already purchased two of these utilities separately for much more than the price of the entire package from The Other Guy's Software.

I recommend *OS-9 Utilities* without reservation to anyone who uses OS-9.

(The Other Guy's Software, P.O. Box H, Logan, UT 84321, $19.95 plus $2.50 S/H)

— Larry Goldwasser

About The One-Liner Contest . . .

THE RAINBOW's One-Liner Contest has now been expanded to include programs of either one or two lines. This means a new dimension and new opportunity for those who have "really neat" programs that simply just won't fit in one line.

Here are the guidelines: The program must work in Extended BASIC, have only one or two line numbers and be entirely self-contained — no loading other programs, no calling ROM routines, no poked-in machine language code. The program has to run when typed in directly (since that's how our readers will use it). Make sure your line, or lines, aren't packed so tightly that the program won't list completely. Finally, any instructions needed should be *very* short.

Send your entry (preferably on cassette) to:

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(Reviewed in RAINBOW April '86 issue, pg. 185)

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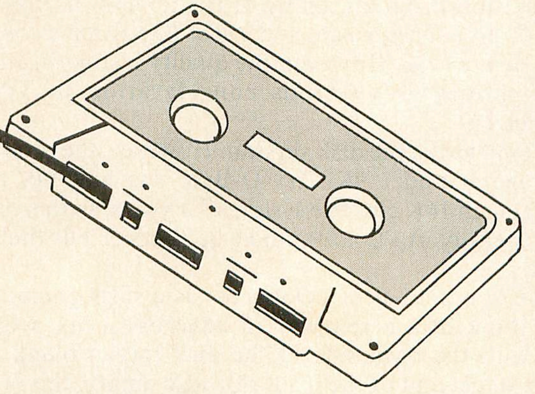

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Programs from Our Past Education Issues:

September 1985 — *CoCo Testmaker*, a test-writing program to aid teachers and students; *Hand Sign*, demonstrates the manual signs and gestures used in sign language; *Pictograph*, illustrates children's daily schedules; *Teacher's Aid*, calculates grade averages and determines letter grades for up to 35 students; *Starfinder*, displays 12 of the more picturesque constellations and provides educational information on each one; *Vocabulary*, a personalized computer dictionary; *Baseball Fever2*, depicts the graphics logo of each of the National League teams; *Tricky Words*, a language program for practice in the correct use of contractions and possessives; *Canada*, a quiz on capital cities and provinces of Canada; *Col-Poem*, composes poems by user's entered statements; *Diving*, both a springboard and platform diving game; *Oratory*, compiles and prints contest scores; and *Bookmark*, a computerized Dewey Decimal System.

September 1984 — *Clock*, teaches youngsters to tell time; *Goldpile*, displays or prints out how your stashed accounts are growing; *MC Quiz*, aids in making multiple-choice tests; *Cooking With CoCo*, a recipe for patch addresses; *Mystery*, a learning game designed to test on various countries in the world; *Database Manager*, part III on creating a disk mailing list; *Word Scrambler*, provides drill and practice of assigned spelling words; *Mad Adder*, a logical math exercise; *ABC Game*, a learning tool for preschoolers; *CoCo School Marm Part I*, creates spelling and pronunciation drills using the cassette recorder; *Map*, a colorful states and capitals quiz; *Education Notes*, a calendar creator; and *Wishing Well*, a multi-math driller.

1986 Tax Estimate: A Good Deal

I am not the typical customer for tax preparation programs. Having done my own income tax returns for over 20 years, I expect an unusual degree of both sophistication and user friendliness. When I reviewed Try-O-Byte's *Try-O-Tax* program some months ago, I criticized formatting and a number of other details. At that time, I remarked that the best part of the package, good enough to be sold as stand-alone software, was a short program which estimated one's tax liability for next year so rapidly that it could conveniently be used to ask "what if" one changes withholding, establishes an IRA, swaps jobs, and so forth.

1986 Tax Estimate is an upgraded development of that small program, and it is so well-done that I look forward with great anticipation to this firm's future efforts. In an estimation program, many of the items I discussed earlier are of no consequence, and *1986 Tax Estimate* is not *Try-O-Tax* for 1986. However, the quality is superb, and implies one should give serious consideration to Try-o-Byte products.

I only tested the disk version. However, the total program storage is under 9K. Try-O-Byte has had tax programs running in 16K cassette systems for years, so this one should do so easily. A `PCLEAR` might be needed, but that is about all.

TE86 is sold at or below cost as a sales gimmick; I cannot think of a better way to advertise a tax program. At $5, with the back side of the disk totally blank and with over 90 percent of the front side also empty, this is too good a deal to pass up. Use the disk for a tax record scratch pad storage area, and consider the program almost free.

No documentation is supplied, but in this case, the menu-driven program is adequately clear and the user probably does not need added documentation.

The user enters estimated values for various items of tax data such as wages, interest income, dividends and similar things. The input includes such categories as income data, deduction data, credits for taxes paid or withheld and so on. From this information a rapid estimate of tax liability can be made of payment due or refund expected. The speed of operation (three to five minutes including agonizing over input values) allows one to play games with how various decisions will affect your income taxes. Most users will simply use it to see if their withholding is correct and adequate, but the capability to analyze more elaborate issues exists. If a particular input item is of little consequence in your case, or the data is not available, an entry of zero is acceptable.

There are some glaring omissions — for example, there is no entry location for unemployment compensation or for social security benefits for those cases where these are taxable income items, nor is separate entry provided for refunds of state income tax when the refund is taxable income. There is no calculation for excess social security taxes paid because of multiple employers. However, most users faced with these situations are aware of them and are likely to make compensating adjustments at the other option. Still, the omissions are somewhat surprising considering how carefully the author considered other categories such as dividends, interest, etc.

The items entered are not recorded in any manner, and are lost at the end of the run. I found this forced me to keep a small scratch pad handy. Normally I would severely criticize any program that did that, but in this case I consider the decision justified. The input list, while fairly comprehensive (about two dozen items), is still short enough for rapid regeneration, and most users will find over half the list is entered as zero because many categories may not apply. And, more important, the confidentiality of financial information is protected by the lack of printout.

The program outputs to an optional printer; just remember to set the Baud rate prior to the run. The output is very short — Estimated Taxable Income, Estimated Tax Liability and Estimated Payment or Refund.

In summary, *1986 Tax Estimate* is worth getting, and if you like it you should consider Try-O-Byte's other products.

(Try-O-Byte, 1008 Alton Circle, Florence, SC 29501, disk or tape $5)

— H. Larry Elman

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Uninterrupted Power Source Prevents File Loss

The Uninterrupted Power Source is a hardware peripheral for the Color Computer from Dynamic Electronics Inc. UPS should be seriously looked at by the user of the CoCo who is concerned about losing files due to a sudden power loss. Businesses and schools using the CoCo should be very interested in this product.

Of course, if you make frequent backups of your files, then perhaps a sudden loss of data and/or programs may not be devastating. But, UPS can help even the casual user in some instances. I was particularly interested since I teach computer literacy with 12 CoCos connected to a Network 2 controller. I have experienced intermittent loss of power when teaching a lesson, which meant reloading the host computer, and then resending the program to the class via the Network.

The Uninterrupted Power Source is designed to provide backup power to five-volt memory chips when commercial power fails, preventing the loss of data and programs. UPS consists of a rechargeable battery, an electronic control circuit, a light emitting diode (LED) and a small toggle switch. If you've ever lost power before making a backup, then you know the frustration. Uninterrupted Power Source prevents this with a simple installation.

UPS comes with one page of instructions. The installation is relatively simple and the only equipment needed is a soldering iron for one connection and a small drill for the LED and toggle switch.

Installation consists of removing the CoCo's cover and finding various components on the board. The instructions state clearly which component to solder one lead to from the rechargeable battery, depending on the model of CoCo you have.

Then, the two other leads from the battery can be placed on either designated pins of the BASIC or Extended BASIC ROM chips, or designated pins of any RAM chip using eyelets which are easily slid over the correct pin. Then reinsert the chips. I chose the RAM-chip option and the entire operation with the leads and soldering took only 10 minutes.

The rest of the installation involves drilling the holes in the case for the LED and the toggle switch. The rechargeable battery should then be placed under the keyboard. I discovered the best place on my machine is on the right side of the center post. The fit was not as tight and the cover could be reset very easily.

Then came the acid test. I loaded a program into the machine and switched the toggle switch to enable the UPS. Then, I turned off the CoCo and turned it back on. Lo and behold, the program was still in memory and would even still run. According to Dynamic Electronics, the battery should retain the memory for "a couple of hours."

The toggle switch can be moved to the disable position if you do not want to protect memory during a session on the computer. The LED is a visual aid in determining whether memory is being protected once the machine is off. The battery is recharged when the CoCo is on, and the electronic circuit prevents overcharging.

In summary, the Uninterrupted Power Source is a product I can see a need for in many computing situations. If you're using the CoCo for important data, then UPS could be a wise investment. If it saves an important data file only once, then it may be worth it.

(Dynamic Electronics Inc., P.O. Box 896, Hartselle, AL 35640, $59.95)

— Donald A. Turowski

One-Liner Contest Winner . . .

Enter the number of grades to be averaged and this program tells how you are doing. The program bases grade inputs on a 100-point scale.

The listing:

```
0 CLS:INPUT"ENTER # OF GRADES TO
 BE ENTERED";N:FORX=1TON:INPUT"E
NTER GRADES";G:S=S+G:NEXTX:A=S/N
:PRINT"NUMBER OF GRADES"N:PRINT"
TOTAL POINTS"S:PRINT"AVERAGE"A
```

Tom Baylie
Chicago, IL

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape.*)

ADOS ENHANCED, EPROM-ABLE DISK BASIC

Now, you can supercharge Basic with an impressive array of extra features WITHOUT sacrificing compatibility! ADOS is compatible with virtually 100% of commercial software. Customizing utilities are provided to allow user-defined command abbreviations, baud rate, step rate, tracks per disk (35 or 40), support of double-sided drives, and more. After customizing ADOS, you can have it burned into an EPROM that plugs into the Disk Basic ROM socket, or just use it in RAM as a 64K disk utility. (EPROM + burning will cost about $20--we provide information concerning how you can have this done.) Features include: • repeat and edit of the last direct-mode command • 26 definable control-key abbreviations • automatic line-number prompts • DOS command • lowercase command entry (a fine complement to a Lowerkit or PBJ WordPak) • COPY (filename) to (drive number) • AE error override option • RAM command (64K) • RUNM command • text echoing to printer • ML monitor • text file scan • enhanced directory • error trapping • hi-res text utility included (42, 51, or 64 characters per line)

"I COULD NOT FIND ANY SOFTWARE THAT WOULD NOT RUN UNDER ADOS."
THE RAINBOW, December 1984
"I LOVE ADOS! . . . A GENUINELY FIRST RATE PRODUCT."
Color Micro Journal, February 1985
"I WON'T PART WITH MY ADOS EPROM FOR ANYTHING . . . NO COMPATIBILITY PROBLEMS."
Hot CoCo,May 1985

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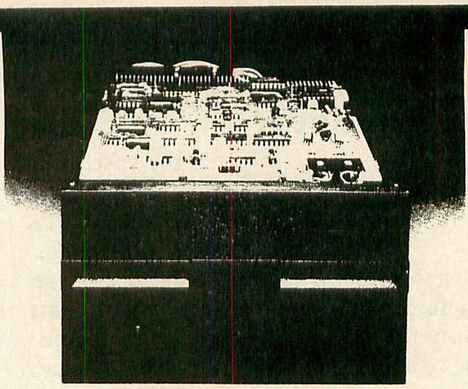

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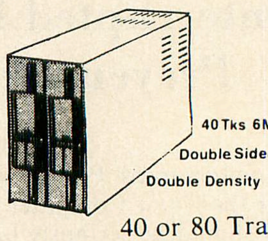

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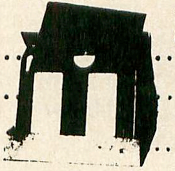

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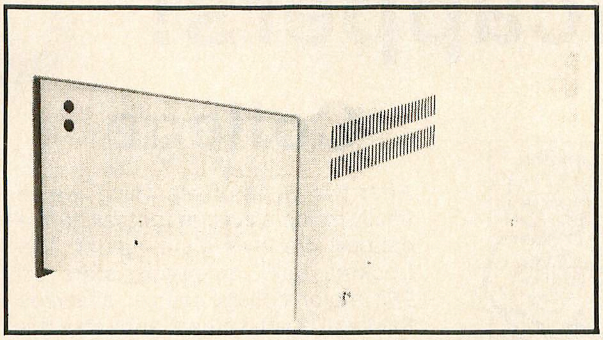

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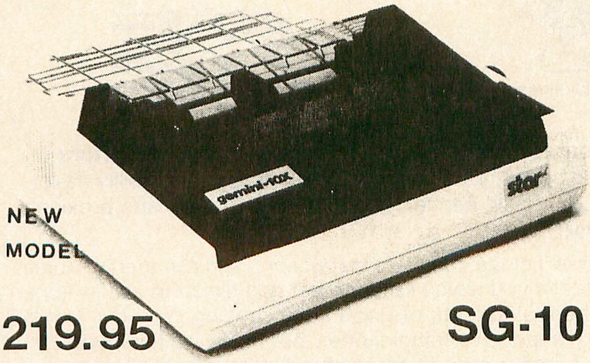

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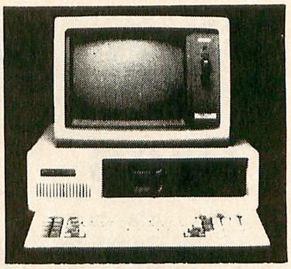

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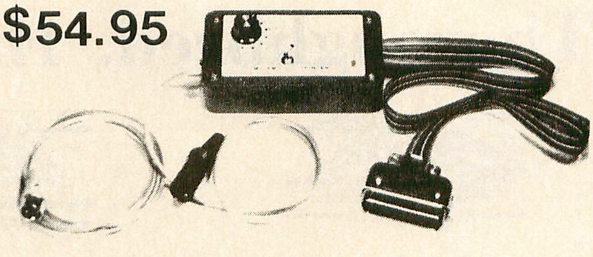

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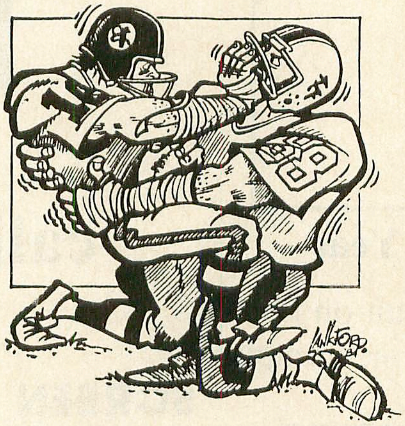

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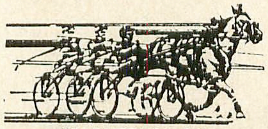

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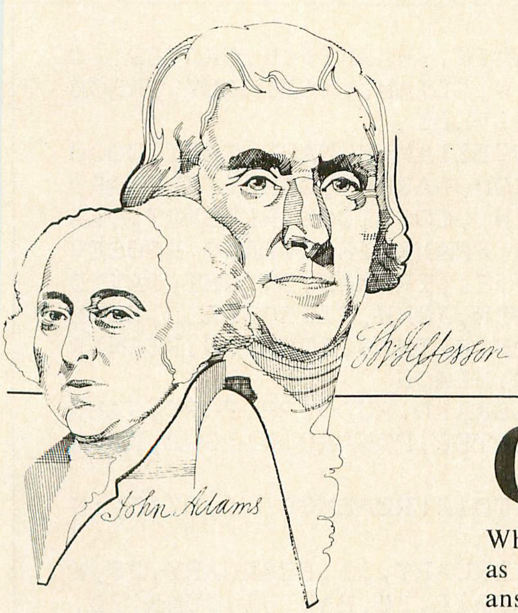
Hail to the Chief



By Edward T. White

Quick — which president preceded Zachary Taylor? Who was president on June 3, 1848? Which president had George M. Dallas as his vice-president? If you know the answers to all these questions, then move along to the next article. If not, read on.

The Presidents is a program for the 16K Color Computer which provides information about the presidents of the United States. The program operates in either the question mode, in which the user is quizzed about facts concerning the presidents, or the answer mode, in which the program supplies answers to questions entered by the user. The program has six categories: List the Presidents in Order, Who Was President On (a given date), Vice Presidents, How Many Terms, Native States and Political Parties.

16K owners must type `PCLEAR1` before loading the program. The title appears and you hear the first two bars of "Hail to the Chief." Then you need only follow the directions in the program. To give some idea of what *The Presidents* contains, a description of its operation follows. For those who quickly tire of typing, the first two categories can be entered intact by only typing in lines 10 to 95 and 165 through 600.

The Presidents is meant to be more a recreational activity and learning tool than a test, so no score is kept. The names of presidents are accepted in a number of forms. William Howard Taft would be acceptable, as would Taft, W. Taft, W. H. Taft, William Taft and William H. Taft (spaces and periods are required). This flexibility was built into the program in order to make it more pleasant to deal with. However, in the question mode this may create an ambiguity — Johnson would be accepted for either Andrew Johnson or Lyndon Johnson. To avoid misunderstanding, and for reinforcement, whenever only the last name is entered, the program prints `CORRECT` along with the full name of the president. In the answer mode, asking a question about Johnson causes the program to give information about the first Johnson it finds, namely Andrew Johnson. To find out about Lyndon Johnson, the user must enter at least L. Johnson.

Category one, List the Presidents, operates in the question mode only and allows several formats. The user may opt either to list the names in a continuing sequence from a chosen or random starting point, or to provide the next president with respect to a random president chosen by the program. The listing in either option may be chosen to proceed either forward or backward.

In category two, Who Was President On . . ., the program calculates which president was in office on a given date from 1789 to 1983. In the question mode, a date is given and a president asked for. In the answer mode, the user enters a date (according to instructions in the program) and the program prints the name(s) of the correct president(s). The program can recognize invalid dates, and is equipped to manage leap years and inauguration days.

In the question mode, category three, Vice Presidents, provides the name of a vice-president and asks for the corresponding president. In the answer mode, the user enters a president and the program lists all his vice-presidents.

Category four, How Many Terms, prints the name of a president in the question mode, and the user must enter (according to instructions in the pro-

---

Edward White is an assistant professor of mathematics at Frostburg State College in Frostburg, Maryland.

gram) a code representing the number of terms, whole or partial, served by the president. In the answer mode, the user enters a president, and the program prints out a sentence describing the number of terms the president served. In either mode, the program prints the specific years involved. For example, (1961-1963).

In categories five and six, Native States and Political Parties, the program prints the name of a president in the question mode, and the user must respond with the appropriate information. The answer mode works the same way, except that the roles of user and program are reversed. In category six, some abbreviations are accepted for political parties — Rep. for Republican, for example.

In either the question or answer mode, entering MENU as the answer to a question returns the user to the menu to choose a new category. In the question mode, pressing ENTER as the answer to a question causes the program to give the correct answer, so a little time with the program can give you a lot of information. Have fun! By the way, the answer to all three questions at the beginning of this article is our 11th president, James K. Polk.

(Questions about this program may be directed to the author at 104 Ormond Street, Frostburg, MD 21532. Please enclose an SASE for a reply.) ☐

60	107	475	74
90	102	570	42
125	101	640	40
180	209	730	165
275	211	800	240
350	82	890	204
420	19	END	235

The listing: PRESIDNT

```
5 'THE PRESIDENTS, EDWARD T. WHI
TE 1986
10 CLS:PRINT@200,"THE PRESIDENTS
"
15 PLAY"O2T3L2GL4ABL2O3CO2L4BAL4
.GL8AL4GEL2DC"
20 PRINT@485,"PRESS ANY KEY TO B
EGIN";
25 A$=INKEY$:RR=RND(0):IFA$=""TH
EN25
30 CLEAR2000:N=40:VN=43:DIMF$(N)
,M$(N),L$(N),MO$(12),DY(12),ST$(
20),PT$(10),VP$(VN),MS$(3),V$(3)
35 CLS:PRINT@200,"READING DATA..
."
40 FOR J=1 TO N:READ F$(J),M$(J)
,L$(J)
45 IF M$(J)=""THEN50ELSE M$(J)=M
$(J)+" "
50 NEXTJ:F$(0)="NOBODY":MS$(0)="
 INCORRECT":MS$(1)=" CORRECT"
55 DATA GEORGE,,WASHINGTON,JOHN,
,ADAMS,THOMAS,,JEFFERSON,JAMES,,
MADISON,JAMES,,MONROE,JOHN,QUINC
Y,ADAMS,ANDREW,,JACKSON,MARTIN,,
VAN BUREN,WILLIAM,HENRY,HARRISON
,JOHN,,TYLER,JAMES,KNOX,POLK,ZAC
HARY,,TAYLOR,MILLARD,,FILLMORE,F
RANKLIN,,PIERCE
60 DATA JAMES,,BUCHANAN,ABRAHAM,
,LINCOLN,ANDREW,,JOHNSON,ULYSSES
,SIMPSON,GRANT,RUTHERFORD,BIRCHA
RD,HAYES,JAMES,ABRAM,GARFIELD,CH
ESTER,ALAN,ARTHUR,GROVER,,CLEVEL
AND,BENJAMIN,,HARRISON,GROVER,,C
LEVELAND,WILLIAM,,MCKINLEY,THEOD
ORE,,ROOSEVELT
65 DATA WILLIAM,HOWARD,TAFT,WOOD
ROW,,WILSON,WARREN,GAMALIEL,HARD
ING,CALVIN,,COOLIDGE,HERBERT,CLA
RK,HOOVER,FRANKLIN,DELANO,ROOSEV
ELT,HARRY,S.,TRUMAN,DWIGHT,DAVID
,EISENHOWER,JOHN,FITZGERALD,KENN
EDY,LYNDON,BAINES,JOHNSON,RICHAR
D,MILHOUS,NIXON
70 DATA GERALD,RUDOLPH,FORD,JAME
S,EARL,CARTER,RONALD,WILSON,REAG
AN
75 FORJ=1TO12:READMO$(J),DY(J):N
EXTJ
80 DATA JANUARY,31,FEBRUARY,28,M
ARCH,31,APRIL,30,MAY,31,JUNE,30,
JULY,31,AUGUST,31,SEPTEMBER,30,O
CTOBER,31,NOVEMBER,30,DECEMBER,3
1
85 IM$="4333333334337333433393333
9333833411;1811"
90 ID$="N44444444645:444?444D444
4>444344<DDFD9DD"
95 IY$="89970109172529374141454 9
5053576165697781818589939701091 3
21232933455361636974778 1"
100 NT$="DBDDDBDBAABAABBCADBAADB
DCCBDACBGCDACCABB"
105 T$="01020303040506070809111 2
141516161818192022232425252627 28
29303132323233343536373738394 0"
110 FOR J=1 TO 43:READ VP$(J):NE
XTJ
115 DATA JOHN ADAMS,THOMAS JEFFE
RSON,AARON BURR,GEORGE CLINTON,E
LDRIDGE GERRY,DANIEL D. THOMKINS
, JOHN C. CALHOUN,MARTIN VAN BUR
EN,RICHARD M. JOHNSON, JOHN TYLE
R,GEORGE M. DALLAS,MILLARD FILLM
ORE,WILLIAM R. KING,JOHN C. BREC
KENRIDGE
120 DATA HANNIBAL HAMLIN,ANDREW
JOHNSON,SCHUYLER COLFAX,HENRY WI
LSON,WILLIAM A. WHEELER,CHESTER
```

```
A. ARTHUR,THOMAS A. HENDRICKS,LE
VI P. MORTON,ADLAI E. STEVENSON,
GARRET A. HOBART,THEODORE ROOSEV
ELT,CHARLES W. FAIRBANKS,JAMES S
. SHERMAN
125 DATA THOMAS R. MARSHALL,CALV
IN COOLIDGE,CHARLES G. DAWES,CHA
RLES CURTIS,JOHN N. GARNER,HENRY
 A. WALLACE,HARRY S. TRUMAN,ALBE
N W. BARKLEY,RICHARD M. NIXON,LY
NDON B. JOHNSON,HUBERT H. HUMPHR
EY,SPIRO T. AGNEW,GERALD R. FORD
,NELSON A. ROCKEFELLER
130 DATA WALTER F. MONDALE,GEORG
E BUSH
135 SB$="12111234115146785999:;9
;94919:<4=>2>?@AB"
140 FOR J=1 TO 18:READ ST$(J):NE
XTJ
145 DATA VIRGINIA,MASSACHUSETTS,
SOUTH CAROLINA,NEW YORK,NORTH CA
ROLINA,NEW HAMPSHIRE,PENNSYLVANI
A,KENTUCKY,OHIO,VERMONT,NEW JERS
EY,IOWA,MISSOURI,TEXAS,CALIFORNI
A,NEBRASKA,GEORGIA,ILLINOIS
150 PP$="001111223323322424444424
24442444224224424"
155 FOR J=1 TO 10:READ PT$(J):NE
XTJ
160 DATA FEDERALIST,FED,DEMOCRAT
IC-REPUBLICAN,DEM-REP,DEMOCRAT,D
EM,WHIG,WHIG,REPUBLICAN,REP
165 GOTO280
170 AN=1:IF N$=L$(R) THENGOSUB22
0:AN=3:MS$(3)=MS$(1)+"--"+NM$:RE
TURN
175 IF N$><F$(R)+" "+L$(R) THEN
185
180 IF R=6 AND N$="JOHN ADAMS" T
HEN GOSUB220:AN=3:MS$(3)=MS$(1)+
"--"+NM$:RETURNELSERETURN
185 IF N$=F$(R)+" "+M$(R)+L$(R)
THEN RETURN
190 IF N$=LEFT$(F$(R),1)+". "+L$
(R) THENRETURN
195 IF N$="JIMMY CARTER" OR N$="
TEDDY ROOSEVELT"THEN RETURN
200 IF M$(R)=""THEN AN=0:RETURN
205 IF N$=F$(R)+" "+LEFT$(M$(R),
1)+". "+L$(R) THEN RETURN
210 IF N$=LEFT$(F$(R),1)+". "+LE
FT$(M$(R),1)+". "+L$(R) THEN RET
URN
215 AN=0:RETURN
220 IF M$(R)=""THENM$="":GOTO230
225 IF R=6 OR R=9 THEN M$=M$(R)
ELSE M$=LEFT$(M$(R),1)+". "
230 NM$=F$(R)+" "+M$+L$(R)
235 RETURN
240 INPUT "PRESIDENT";N$
245 IF N$="MENU"THENAN=2:RETURN
250 N1$=RIGHT$(N$,4)
255 FOR R=1 TO N
260 IF N1$><RIGHT$(L$(R),4)THEN
AN=0:GOTO270
265 GOSUB170:IF AN=1 OR AN=3 THE
N RETURN
270 NEXT R
275 PRINT "NOT FOUND. IS YOUR SP
ELLING    CORRECT?":RETURN
280 CLS:PRINT "CHOOSE CATEGORY"
285 PRINT "1  LIST THE PRESIDENT
S IN          ORDER"
290 PRINT "2  WHO WAS PRESIDENT
ON...?"
295 PRINT "3  VICE PRESIDENTS"
300 PRINT "4  HOW MANY TERMS...?
"
305 PRINT "5  NATIVE STATES"
310 PRINT "6  POLITICAL PARTIES"
315 INPUTQ:PRINT:IFQ<1ORQ>6 THEN
PRINT@319," ";:GOTO315
320 CLS:PRINT"CHOOSE:":PRINT"Q
THE PROGRAM ASKS QUESTIONS,ORA
THE PROGRAM WILL ANSWER YOUR
QUESTIONS":PRINT
325 IF Q=1 THEN340
330 INPUT "Q OR A";MD$:IF MD$><"
Q" AND MD$><"A" THEN330
335 IF Q=2 AND MD$="A" THEN355
340 CLS:PRINT"TO RETURN TO THE M
ENU, ENTER    MENU AS THE ANSWER
 TO A QUESTION"
345 IF MD$><"A" THEN PRINT"DURIN
G YOUR CATEGORY, PRESS     <ENTE
R> IF YOU WANT TO REVEAL   THE A
NSWER TO A QUESTION"
350 PRINT:PRINT "NOW PRESS <ENTE
R> TO BEGIN YOUR CATEGORY":INPUT
A$
355 CLS:ON Q GO TO 360,445,605,7
50,885,945
360 CLS:PRINT "CATEGORY: LIST TH
E PRESIDENTS":PRINT
365 RF$="":PRINT "1 LIST PRESIDE
NTS FROM A CHOSEN   STARTING POI
NT TO END, OR":PRINT"2 ANSWER RA
NDOM SINGLE QUESTIONS";:INPUT SF
$:PRINT:SF=VAL(SF$):IFSF$="MENU"
THEN280
370 IF SF<1ORSF>2THEN365
375 PRINT "LIST PRESIDENTS":PRIN
T"F  FORWARD, OR":PRINT"B  BACKW
ARD":INPUTFF$:IF FF$="B" THEN FF
=-1 ELSE FF=1
380 IF FF$="MENU"THEN280
385 IF SF=1 THENPRINT:PRINT"BEGI
NNING WITH...?":PRINT"ENTER THE
```

```
NAME OF A PRESIDENT,  OR PRESS <
ENTER> FOR A RANDOM  STARTING P
OINT":INPUTRF$
390 CLS:IFRF$=""THEN P=RND(N):GO
TO405
395 N$=RF$:GOSUB245:P=R:IFAN=0 T
HEN385ELSE IF AN=2THEN280
400 CLS
405 R=P:P1=P+FF:IF P1=0 OR P1=N+
1 THEN 440
410 IF SF=0 THEN 420
415 GOSUB 220:PRINT STR$(P);".";
NM$:IF SF=1 THEN PRINT
420 P=P1:R=P:PRINT STR$(P);".";:
INPUTN$:IF N$=""THEN GOSUB 220:P
RINT:PRINT STR$(P);".";NM$:PRINT
:GOTO435ELSE IF N$="MENU"THEN280
425 GOSUB170:PRINT MS$(AN)
430 PRINT:IF AN=0 THEN 420
435 IF SF<=1 THEN SF=0:GOTO 405
ELSE P=RND(N):GOTO405
440 IF SF<=1 THEN INPUT "PRESS E
NTER TO RETURN TO THE     MENU";Q
$:GOTO280ELSEGOTO390
445 PRINT "CATEGORY:WHO WAS PRES
IDENT ON..."
450 IF MD$><"A" THENM1=RND(12):D
1=RND(DY(M1)):Y1=RND(186)+1797:G
OTO515
455 PRINT"ENTER MONTH,DAY,YEAR (
1789-1983)SEPARATED BY COMMAS (F
OR EXAMPLENOV,13,1949 OR 11,13,1
949). TO  RETURN TO THE MENU, EN
TER      MENU,0,0"
460 PRINT:INPUT "DATE";M1$,D1$,Y
1$:M1=VAL(M1$):D1=VAL(D1$):Y1=VA
L(Y1$):IF M1$="MENU"THEN280
465 IFM1>0 AND M1<13 THEN490
470 FORM1=1TO12
475 IF LEFT$(M1$,3)=LEFT$(MO$(M1
),3)THEN490
480 NEXTM1
485 PRINT"INVALID MONTH":GOTO460
490 IF Y1=1789 AND D1=30 AND M1=
4 THENPRINT"GEORGE WASHINGTON BE
CAME THE     FIRST PRESIDENT OF T
HE UNITED    STATES.":GOTO460
495 IFY1=1900 OR Y1=1800 THEN 50
5
500 IF D1=29 AND M1=2 AND Y1=4*I
NT(Y1/4) THEN510
505 IF D1<1 OR D1>DY(M1) THENPRI
NT"INVALID DATE":GOTO460
510 IF Y1<1789 OR Y1>1983 THENPR
INT"YEAR OUT OF RANGE":GOTO460
515 IF Y1=1849 AND D1=4 AND M1=3
 THEN D1=5:IFMD$="A"THENPRINT"JA
MES K. POLK LEFT OFFICE ON     MA
R.4, BUT ZACHARY TAYLOR WAS     NO
T INAUGURATED UNTIL MAR 5.":GOTO
460
520 FORJ=1TON
525 YR=VAL(MID$(IY$,2*J-1,2))+18
00+100*INT((J-3)/23)
530 IFYR>=Y1 THEN540
535 NEXTJ:J=N:GOTO570
540 J=J-1:MN=ASC(MID$(IM$,J+1,1)
)-48:DN=ASC(MID$(ID$,J+1,1))-48
545 IFYR>Y1 THEN570
550 IFMN<M1 THENJ=J+1:GOTO570
555 IFMN><M1 THEN570
560 IFDN<D1 THENJ=J+1
565 IFDN=D1 THEND1=D1+1:J=J+1:IF
MD$="A"THEN595
570 IFMD$="A"THENR=J:GOSUB220:PR
INTNM$:GOTO460
575 PRINT:PRINT"WHO WAS PRESIDEN
T ON":PRINTMO$(M1);STR$(D1);",";
Y1;"?"
580 INPUTN$:IFN$=""THENR=J:GOSUB
220:PRINTNM$:GOTO450
585 IFN$="MENU"THEN280
590 R=J:GOSUB 170:PRINTMS$(AN):I
FAN=0THENPRINT:GOTO580ELSE450
595 R=J-1:GOSUB220:P1$=NM$:R=J:G
OSUB220:P2$=NM$
600 PRINT"THE PRESIDENCY PASSED
FROM":PRINTP1$;" TO":PRINTP2$:GO
TO460
605 PRINT "CATEGORY: VICE PRESID
ENTS":PRINT
610 PRINT:IF MD$><"A" THEN R1=RN
D(VN) ELSE 665
615 P=VAL(MID$(T$,2*R1-1,2))
620 R=P:GOSUB220
625 PRINT "WHICH PRESIDENT HAD":
PRINT VP$(R1):PRINT "AS HIS VICE
 PRESIDENT?"
630 INPUT N$
635 IF N$="MENU" THEN 280
640 IF N$=""THEN PRINT NM$:GOTO6
10
645 R=P:GOSUB170
650 IF R1=4 AND AN=0 THEN R=4:GO
SUB170
655 IF R1=7 AND AN=0 THEN R=7:GO
SUB170
660 PRINT MS$(AN):IFAN=1 OR AN=3
 THEN610ELSE630
665 GOSUB 240:PRINT:ON AN+1 GOTO
665,670,280,670
670 IF R<N+1 THEN GOSUB220:NV=0E
LSE 610
675 L=2*VN
680 FORJ=1 TO L STEP 2
685 V=VAL(MID$(T$,J,2))
690 IF R=V THEN NV=NV+1:V$(NV)=V
P$((J+1)/2)
```

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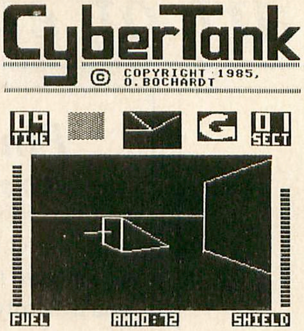

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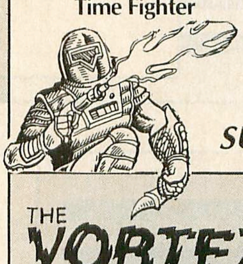

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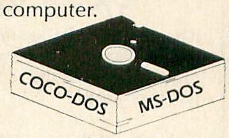

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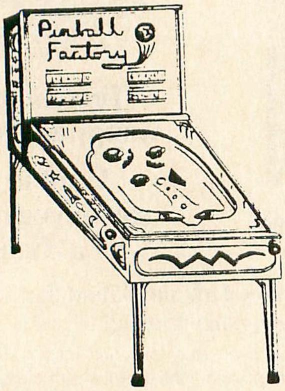


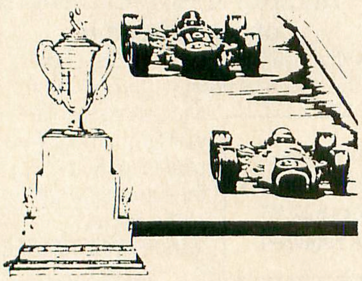
Pinball Factory *by Kary McFadden*

The video game comes full circle in this glorious tribute to the original. Classic pinball spings to life as never before, with fresh new angles that only the computer can offer. Crisp graphics, sound, and fast, smooth action give this machine-language arcade game a realistic, responsive feel you'll hardly believe. There are even "tilt" buttons that let you "bump" the machine!

In addition to playing a great game of pinball, you can enjoy hours of creative pleasure as you design, build, and edit your own screens. Save and load your favorite creations. The joystick-controlled cursor makes it all easy.

Change the board: build with bumpers, tabs, and a multitude of solid obstacles to form any configuration imaginable.
Change the face: draw your own title board with lines, rays, and shape patterns. Add text in three different colors, and two dirrent sizes.
Change the rules: alter the gravity, bounce, and scoring!

64K Color Computer required. $34.95



Speed Racer *by Steven Hirsch*

The checkered flag drops as your pulse rises in this lively new arcade game. The road twists to the horizon on the 3-D panorama that sets the stage for the most exciting race the CoCo has ever seen!

Vie for time as you speed through the curves at incredible speeds. Step through the gears to stay ahead of the pack, but step lively since some will stop at nothing to see the end of the race, or the end of you!

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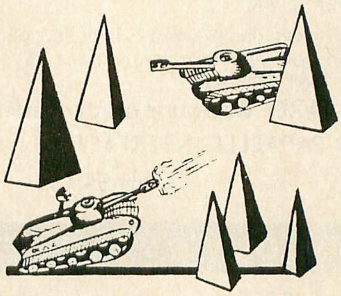

Rommel 3-D *by Kary McFadden*

You clutch the tank controls, searching for any sign of the enemy. Suddenly a blip appears on radar! Frantically, you move your tank into position. At last you spot the elusive enemy tank! Facing it, you race to lock sights and fire before he does!

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```
695 IF R<V THEN 705
700 NEXT J
705 IF NV=0 THEN 745
710 IF J=11 THEN NV=2:V$(2)=V$(1
):V$(1)="GEORGE CLINTON"
715 IF J=17 THEN NV=2:V$(2)=V$(1
):V$(1)="JOHN C. CALHOUN"
720 IF J=2*VN+1 THEN R=N:GOSUB22
0:PRINT NM$;"'S":PRINT"VICE PRES
IDENT IS ";VP$(VN):GOTO610
725 IF J=43 THEN NV=2:V$(2)="ADL
AI E. STEVENSON"
730 IF NV=1 THEN SX$="" ELSE SX$
="S"
735 PRINT NM$;" HAD":PRINT RIGHT
$(STR$(NV),1);" VICE PRESIDENT";
SX$;":"
740 FOR K=1 TO NV:PRINT "--";V$(
K):NEXTK:GOTO610
745 PRINT NM$;" HAD":PRINT "NO V
ICE PRESIDENTS":GOTO610
750 PRINT "CATEGORY: HOW MANY TE
RMS...":PRINT
755 IF MD$="A" THEN 760 ELSEPRIN
T "ANSWER IN THE FORM":PRINT " 1
-   (LESS THAN ONE TERM)":PRINT
" 1    (EXACTLY ONE TERM)":PRINT
" 2-   (MORE THAN ONE TERM, BUT
         LESS THAN TWO)":PRINT "E
TC."
760 IF MD$="Q" THEN R=RND(N-1):P
RINT:GOTO 770
765 PRINT:GOSUB240:ON AN+1 GOTO7
65,770,280,770
770 R1=R:IF R=22 OR R=24 THEN CF
=1:TR$="2":GOTO800
775 IF R=N THEN PRINT "HE'S NOT
FINISHED YET":GOTO760
780 YI=VAL(MID$(IY$,2*R-1,2))+18
00+INT((R-3)/23)*100
785 YL=VAL(MID$(IY$,2*R+1,2))+18
00+INT((R-2)/23)*100
790 TR=.5*(ASC(MID$(NT$,R,1))-64
):TS=INT(TR)
795 IF TR=TS THEN TR$=RIGHT$(STR
$(TR),1)ELSE TR$=RIGHT$(STR$(TS+
1),1)+"-"
800 GOSUB220
805 IF MD$="A" THEN 850
810 PRINT "HOW MANY TERMS DID ":
PRINTNM$;" SERVE";:INPUT TU$
815 IF TU$=""THENPRINT TR$:GOTO8
35
820 IF TU$="MENU" THEN 280
825 IF TU$><TR$ THEN 845
830 PRINT "CORRECT"
835 IF CF=0 THEN PRINT "(";RIGHT
$(STR$(YI),4);"-";RIGHT$(STR$(YL
),4);")":GOTO760
840 CF=0:PRINT "(1885-1889, 1893
-1897)":GOTO760
845 PRINT "INCORRECT":INPUT TU$:
GOTO815
850 VL=VAL(TR$):IF VL=1 THEN EX$
="TERM" ELSE EX$="TERMS"
855 IF LEN(TR$)=1 THEN TR$=TR$+"
":GOTO875
860 IF VL=1 THEN TR$="LESS THAN
ONE ":GOTO875
865 NO$=EX$:IF VL=2 THEN NO$="TE
RM"
870 TR$="MORE THAN"+STR$(VL-1)+"
 "+NO$+" BUT LESS THAN "+STR$(VL
)+" "
875 PRINT NM$;" SERVED":PRINT TR
$;EX$
880 GOTO 835
885 PRINT "CATEGORY: NATIVE STAT
ES"
890 PRINT:IFMD$="A"THENGOSUB240:
ON AN+1 GOTO890,900,280,900
895 R=RND(N)
900 S=ASC(MID$(SB$,R,1))-48
905 S$=ST$(S)
910 GOSUB220
915 IF MD$="A" THEN PRINT NM$:PR
INT "WAS BORN IN ";S$:GOTO890
920 PRINT "IN WHICH STATE WAS":P
RINT NM$;" BORN?"
925 INPUTA$
930 IF A$="MENU" THEN 280
935 IF A$="" THEN PRINT S$:GOTO8
90
940 IF A$=S$ THEN PRINT "CORRECT
":GOTO 890 ELSE PRINT "INCORRECT
":GOTO925
945 PRINT "CATEGORY: POLITICAL P
ARTIES"
950 PRINT:IF MD$="A"THENGOSUB240
:ON AN+1 GOTO950,960,280,960
955 R=RND(N)
960 PT=ASC(MID$(PP$,R,1))-47
965 T1$=PT$(2*PT-1):T2$=PT$(2*PT
)
970 GOSUB220:IFR=N THENVB$="IS "
:VC$="DOES"ELSEVB$="WAS ":VC$="D
ID"
975 IF MD$="A" THEN PRINT NM$:PR
INT VB$;"A ";T1$:GOTO950
980 PRINT "TO WHICH POLITICAL PA
RTY ";VC$:PRINT NM$; " BELONG?"
985 INPUT A$
990 IF A$="" THEN PRINT T1$:GOTO
950
995 IF A$="MENU" THEN 280
1000 IF A$=T1$ OR A$=T2$ THEN PR
INT "CORRECT":GOTO950 ELSE PRINT
 "INCORRECT":GOTO985
```

This version includes an updated matching test section for true randomizing of pairs

CoCo Testmaker Revisited

By Ron Powers

I found *CoCo Testmaker* by Lynn C. Sherman and Walter Baldassaro (September 1985, Page 30) to be a fine and useful program. I have used it this school year to compose several tests. There was one section, however, that I didn't like. The matching test always gave the same answer key. It was not truly randomizing the pairs. I have rewritten that section of the *CoCo Testmaker.*

I found their line numbering a little disconcerting and renumbered the program to suit my own style. I also changed their `INPUT` statements to `LINE INPUT` statements, so punctuation marks can be used without losing some of the questions or statements.

In lines 6060 through 6090 a `FOR/NEXT` loop assigns the pairs of statements to strings G$(X) and H$(X). Lines 6110 through 6170 randomize the pairs of statements with lines 6130 and 6150 as counters to eliminate statements already used.

I plan to further refine other parts of the *Testmaker* to make the program a little easier to use. Nonetheless, I offer the original authors my heartfelt thanks for getting me started on computerized test writing.

Note that I have changed the Print Test Heading section a little so that Class or Subject, Test Title, Date and a space for Name are all printed.

(Questions about this program may be directed to Mr. Powers at Rt. 1 Box 43, Davenport, ND 58021, 701-347-4321. Please enclose an SASE when writing.) ☐

Ron Powers lives in Davenport, North Dakota and teaches high school English. Before reentering the teaching profession in 1985, he spent 20 years as a broadcast journalist. A CoCo owner for three years, Ron has only had a serious interest in programming for less than a year.

1040	6	5120	186
2090	117	6135	251
4000	95	END	54
4310	110		

The listing: `TESTMAKR`

```
1 GOTO 5
2 SAVE"TESTMAKR":SAVE"TESTER",A:
END
5 CLS:CLEAR 2000
10 PRINT"MAKE SURE PRINTER IS ON
 AND      PAPER IS SET TO TOP OF
PAGE
20 PRINT"PRESS A KEY TO BRING UP
 MENU"
30 INPUT A$
40 CLS
50 INPUT"    1 PRINT TEST HEADING
             2 MULTIPLE CHOICE
             3 FILL IN THE BLANK
             4 ANSWER QUESTIONS
             5 TRUE FALSE
             6 MATCHING";N
```

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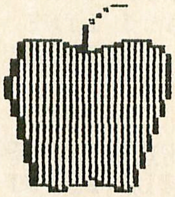

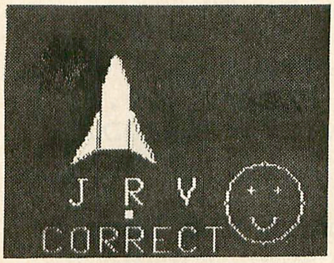

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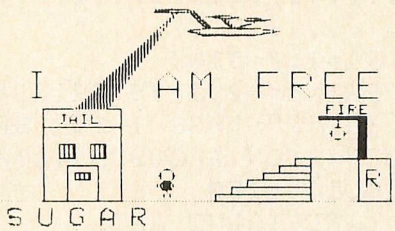

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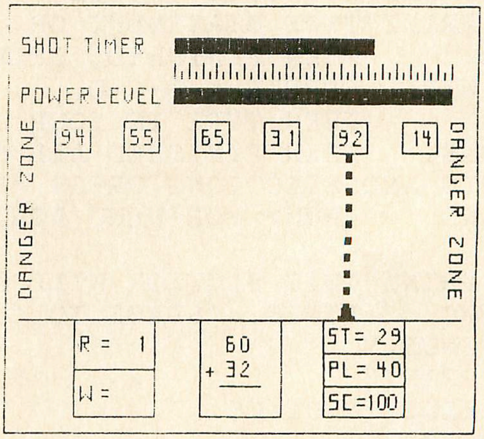

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```
60 IF N <1 OR N >6 THEN 50
70 ON N GOSUB 1000, 2000, 3000,
4000, 5000, 6000
1000 CLS:INPUT "CLASS OR SUBJECT
";C$
1010 INPUT "TEST TITLE";T$
1020 INPUT "DATE AS 00/00/00";D$
1030 PRINT#-2,"":PRINT#-2,"":PRI
NT#-2,"":PRINT#-2,"
            "+C$:PRINT#-2,""
1040 PRINT#-2,"
        "+T$:PRINT#-2,""
1050 PRINT#-2,"
        "+D$:PRINT#-2
1060 PRINT#-2,"   NAME .........
.....................    PERIOD...
..":PRINT#-2
1070 CLS:GOTO 50
2000 PRINT#-2,"Circle the best a
nd most correct answer for each
statement."
2010 J=0
2020 CLS
2025 PRINT"MULTIPLE CHOICE"
2030 PRINT"TYPE STATEMENT OR QUE
STION.     WHEN FINISHED, SELECT
IONS WILL  APPEAR A-B-C-D.
           THEN TYPE IN YOUR SEL
ECTIONS.   WHEN FINISHED ALL STA
TEMENTS ANDSELECTIONS PRESS <BRE
AK> AND    <RUN> FOR MENU AGAIN.
"
2040 PRINT"THIS SECTION WILL ACC
EPT TWO    LINES.  SPACE TO ^ TO
 CONTINUE."
2045 PRINT"                  ^"
2050 LINE INPUT C$
2060 CLS
2070 J1=1:J=J1+J
2080 PRINT#-2,"":PRINT#-2,J;TAB(
5)C$:PRINT#-2,""
2090 C2$="A.":C3$="B.":C4$="C.":
C5$="D."
2100 LINE INPUT "A. ";A$:LINE IN
PUT"B. ";B$:LINE INPUT"C. ";C$:L
INE INPUT"D. ";D$
2110 PRINT#-2,TAB(10)C2$+A$:PRIN
T#-2,TAB(10)C3$+B$:PRINT#-2,TAB(
10)C4$+C$:PRINT#-2,TAB(10)C5$+D$
2120 GOTO 2040
3000 CLS:PRINT"FILL IN THE BLANK
S"
3010 PRINT#-2,"Fill in the blank
s of each of the statements.":PR
INT#-2,""
3020 PRINT"THIS SECTION WILL ACC
EPT TWO    LINES PLUS CHARACTERS
 TO THE ^. IF MORE SPACE IS NEED
ED, PRESS  <ENTER> TO CONTINUE Q
UESTION."
3030 PRINT"STATEMENT OR QUESTION
                          ^"
3040 LINE INPUT F$
3050 J1=1:J=J1+J
3060 PRINT#-2,J;F$:PRINT#-2,""
3070 INPUT "PRESS 1 FOR SPACE IF
 NEEDED";A:ON A GOSUB 3090
3080 GOTO 3020
3090 LINE INPUT AA$
3100 PRINT#-2,TAB(3)AA$:PRINT#-2
,""
3110 GOTO 3020
4000 CLS:PRINT"ANSWER QUESTION"
4010 PRINT#-2,"Answer questions
on lines provided.":PRINT#-2,""
4020 CLS:PRINT"THIS SECTION WILL
 ACCEPT TWO    LINES PLUS CHARAC
TERS TO THE ^. IF MORE SPACE IS
NEEDED, PRESS  <ENTER> TO CONTIN
UE."
4030 PRINT"QUESTION
                          ^"
4040 LINE INPUT Y$
4050 YY$="......................
................................
...................."
4060 J1=1:J=J1+J
4070 PRINT#-2,J;Y$:PRINT#-2,""
4080 INPUT"PRESS 1 FOR SPACE IF
NEEDED";A:ON A GOSUB 4100
4090 GOTO 4150
4100 LINE INPUT AA$
4110 PRINT#-2,TAB(3)AA$:PRINT#-2
4150 INPUT "HOW MANY LINES 1-2-3
-4 ";H
4160 ON H GOSUB 4200, 4300, 4400
, 4500
4200 PRINT#-2,YY$:PRINT#-2,""
4210 GOTO 4020
4300 PRINT#-2,YY$:PRINT#-2,"":PR
INT"-2,YY$:?#-2
4310 GOTO 4020
4400 PRINT#-2,YY$:PRINT#-2,"":PR
INT#-2,YY$:PRINT#-2,"":PRINT#-2,
YY$,:PRINT#-2,""
4410 GOTO 4020
4500 PRINT#-2,YY$:PRINT#-2,"":PR
INT#-2,YY$:PRINT#-2,"":PRINT#-2,
YY$:PRINT#-2,"":PRINT#-2,YY$:PRI
NT#-2,""
4510 GOTO 4020
4999 END
5000 PRINT#-2,"Circle TRUE if th
e statement is true.  Circle FAL
SE if the statement is false.":P
RINT#-2,""
5010 CLS
5020 J=0
```

```
5030 PRINT"TRUE - FALSE QUESTION
S"
5040 PRINT"THIS SECTION WILL PRI
NT 50       CHARACTERS PER LINE.
 TYPE UP    TO THE FIRST ^ ON THE
 SECOND     LINE THEN SPACE TO TH
E SECOND ^ TO CONTINUE"
5050 PRINT"                     ^
                                ^"
5060 LINE INPUT A$
5070 B$="TRUE - FALSE  "
5080 Q$="  "
5090 J1=1
5100 J=J1+J
5110 PRINT#-2,J;B$;Q$;A$:PRINT#-
2,""
5120 CLS:GOTO 5030
5130 END
6000 PRINT#-2,"Match column A wi
th column B in space provided.":
PRINT#-2,""
6005 CLEAR 2000
6010 CLS:PRINT:PRINT"          MA
TCHING TEST"
6020 PRINT"THIS SECTION WILL RAN
DOMIZE TEN ITEMS IN COLUMN A WIT
H TEN ITEMSIN COLUMN B"
6030 PRINT:PRINT"COLUMN A CAN BE
 UP TO THE ^ ON  ONE LINE.  COLU
MN B CAN BE UP TOTHE ^ ON THE SE
COND LINE"
6060 FORX=1TO10
6065 PRINT"
   ^"
6070 LINE INPUT "A- ";G$(X)
6075 PRINT"           ^"
6080 LINE INPUT "B- ";H$(X)
6090 NEXT X
6095 CLS:PRINT @ 236,"WORKING"
6100 DIM A$(10),B$(10)
6110 FORY=1TO10
6120 X=RND(10)
6130 IF A$(X)<>"" THEN 6120
6135 A$(X)=G$(Y)
6140 X=RND(10)
6150 IF B$(X)<>""THEN 6140
6160 B$(X)=H$(Y)
6170 NEXT Y
6200 FORX=1TO10
6205 L2$="  ..."
6210 PRINT#-2,L2$;A$(X);TAB(30);
X;"- ";B$(X)
6220 PRINT#-2,""
6230 NEXT X
```

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Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs that are useful/helpful/fun for other CoCo owners.

Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary explaining how the program works. Generally, we're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a self-addressed, stamped envelope (SASE) to: Submissions Editor, THE RAINBOW, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. We will send you some more comprehensive guidelines.

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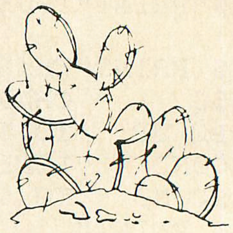

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TAKING BASIC TRAINING

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Using Inverse Characters

By Joseph Kolar
Rainbow Contributing Editor

As I sit here, weak and weary, pondering the subject of this article, my mind wanders rapidly over an arpeggio of CoCo statements and commands.

Over the past several years, a variety of topics have been touched upon that are a constant source of interest to beginners eager to learn a little and create a lot.

Often, mulling over a topic I am eager to explore together with the newcomer, I have the vague sense of having covered that phase of CoCo's repertoire a few years ago. Repeating material is unfair to the faithful veterans who have marched through these tutorials. Hopefully, the veterans will pass on to greater glory and allow the new recruits to have their turn at BASIC Training.

As there will always be a Britannia, so too will there always be new recruits to augment the vast army of CoConuts.

Newcomers may not realize how much valuable information is stored in the treasury of back issues of THE RAINBOW. You should consider picking up some of the back issues. Of course, the ideal solution is to purchase those available.

Starting with the July 1983 Anniversary issue, a yearly index of articles has been presented. Since you might only be interested in selected topics, you may want to purchase Anniversary issues first. If you see some topic near and dear to your heart, pick up the back issue containing the desired article.

Let me caution you — the more of CoCo's secrets you become privy to, the more you want to explore. Rest assured, a vast storehouse of CoCo wisdom resides in the back issues of our favorite computer magazine waiting to be tapped. Remarkably, just a mere fraction of the treasure trove is obsolete. Go back and review the state of the art in 1981 up until you joined the ranks of CoConuts.

Isn't it tempting to traipse down memory lane and discover something new and intriguing you may have overlooked or not been aware of?

On occasion, the newcomer comes across an interesting program listing that may be Greek to him, but is nevertheless fascinating. He has an itch to understand how it works.

The beginner is urged to investigate. You are encouraged to take chunks of a large listing or the entire listing, if it is short and analyze it.

For this purpose, you need a regular 40-page, 10½ by 8-inch, ruled, one-subject notebook. You may want a few notebooks to store different categories of notes. As so often happens, you discover an interesting routine you want to preserve for future use and want a permanent copy of it in words that make sense to you for ready reference.

We'll start out using Listing 1, the tutorial for today. This program is meant to display material in inverse characters. Key in this listing and run it with the volume up.

On the inverse screen, (`CLS0`), using the ASCII character codes for lowercase (inverse colors) in a `DATA` statement, I displayed my name to give this tutorial a personal flavor. In Line 60, substitute values that spell out your name. Refer to the manual. Use decimal code `A=97` through `Z=122`. Use `'blank space'=128` to separate the names. Do not skip any spaces and separate each value with a comma.

Count the number of characters in the revised Line 60.

In the `FOR X=` and `FOR Y=` statements in Line 10, counting up from and including 10, calculate the number of letters/spaces in your name. If the total

---

Florida-based Joseph Kolar is a veteran writer and programmer and specializes in introducing beginners to the powers of CoCo.

is not 12, (which ends at 21), edit this value to reflect the proper number. Run your work.

Chances are you want to be neat and recenter your name. Adjust both values in the two `FOR` statements, plus or minus the same amount. Thus, if your name is 16 characters long, move the first letter to begin two spaces to the right, 10-2 to 25-2, (8 to 23) in both `FOR` statements. Run it, adjust to your satisfaction and then press BREAK.

List Line 60 and crack open the analysis notebook. Number all the pages. Leave the first page blank and use it for the table of contents.

At the top of the second sheet, to the left of the red vertical line, write the first line number. On the right side, copy the line from the screen. If it is a multiple-line statement, consider each statement to be a single entry in the analysis.

On the next line to the right of the red vertical line, write, in pencil, an explanation or the significance of the statement in your own words, because it must have meaning to *you.* If you cannot determine the meaning or use of the line, skip a few lines and enter the next statement. You can always go back to unannotated statements.

It would begin like this:

0 LISTING1
  Title.
10 CLS0
  Clear screen to black to print inverse characters.
FOR X = 10 TO 21:
  Total of number of letters to be displayed.
21-10+1=12.
  Locates `PRINT@` locations to begin with J at Print@10.
PLAY"L200V15B:"
  A dual-purpose statement. (sound plus time elapsed). Musical note B in default octave, O2; also volume default V15, even though used, has a short duration of L200, which determines the time between displayed characters.
READA:
  This refers to the only `DATA` statement at Line 60, which is to be read into memory.

At this point, you may want to list Line 60, even though it will be out of sequence. Remember, this is your analysis so do it any way that makes sense to you.

60 DATA106,111,115,101,112,104,128, 107,111,108,97,114
  This is number of characters/spaces, 12, in reversed lowercase ASCII code. The first letter read is CHR$(106), J to be located at X, 10. The second letter is CHR$(111), O, to be located at X+1, etc.
CONT10 PRINT@X,CHRS(A);:
  Prints selected characters, A, in turn, at selected location, X. Note ';' is used to chop off trailing line, which would destroy the effect.

And so forth, statement by statement. If you can't puzzle out the significance of a statement, change values and note any differences. This may give a clue.

For instance, change `30` in Line 20 to `300` and run. This allows you to view the sequence of character movement in slow motion. Change it to `3` and run. This should tell you that if you speed up or slow down the duration of the sound,

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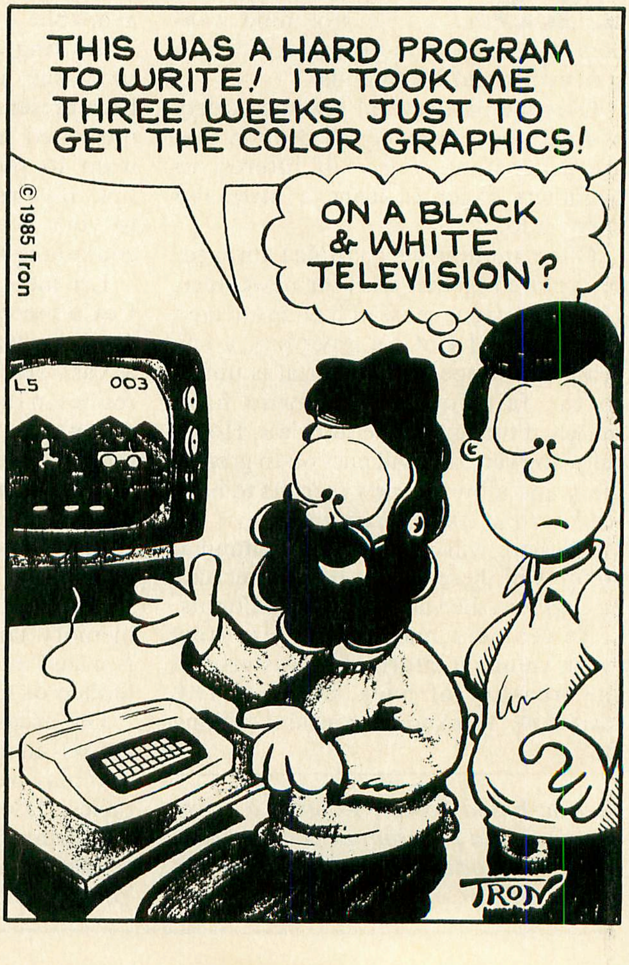
LOOSE STRINGS / by Tron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L5
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you zap the desired sound effect, not to mention the time lapse.

Another example: Temporarily delete from Line 20 `:GOSUB 70`, and at end of Line 30 add `:GOSUB 70`. Now run.

The major program parts are: nested loop (lines 10 through 40), data (Line 60) and the music `GOSUB` routine (lines 70 through 110). The `CHR$(RND(26)+96);` displays one randomly chosen lowercase letter from 'A' through 'Z' (26). Since the ASCII codes begin at 97, to eliminate all unwanted characters, 96 is added to the random number chosen. Thus, `RND(1)+96=97` displays a reverse 'A', `RND(2)+96=98` displays a reverse 'B', and so on.

The `GOSUB` routine chooses at random one of two volumes. A choice of four notes is randomly selected so that one of them will be sounded at one of the two volume levels every time a character is displayed.

If you returned `GOSUB 70` to its original location, put a `REM` marker in front of it. Run and note the effect.

Do not be afraid to change values in order to see what happens.

Here is an interesting one: Count the number of letters in your surname. Subtract from the high value in the `FOR Y` statement in Line 10. For example, Kolar has five letters, so 21 minus five equals 16. Substitute this for the low value (in our example it would be `FOR Y=16 TO 21`), and run it. This is a confusing, but effective version. The given name is displayed one letter at a time while the surname is jumbled. After the first name is completely displayed, the second name unravels.

During analysis, there may be routines you want to save for future reference. There is no need to commit them to memory. Copy them, with an explanation, into one of the reference notebooks.

This last version of displaying a name evolved through a dozen transformations that produced two allied fun programs for your entertainment.

Listing 1: `INVERSE`

```
0 '<LISTING1>
10 CLS0:FORX=10TO21:PLAY"L200V15
B":READA:PRINT@X,CHR$(A);:FOR Y=
10TO21
20 FORZ=1TO30:NEXT:GOSUB70
30 IF Y>X THEN PRINT@Y,CHR$(RND(
26)+96);
40 NEXTY,X
50 GOTO50
60 DATA106,111,115,101,112,104,1
28,107,111,108,97,114
70 P=RND(2):IF P=1 THEN PLAY"V15
" ELSE PLAY"V25":Q=RND(4): ON Q
GOTO80,90,100,110
80 PLAY"A":RETURN
90 PLAY"C":RETURN
100 PLAY"F":RETURN
110 PLAY"E":RETURN
```

Listing 2: `STUTTER1`

```
0 '<STUTTER1>
10 CLS0:FORX=9TO21:PLAY"L255O5CC
":READA:PRINT@X,CHR$(A);:FORY=11
 TO 21 STEP2
20 IF Y>X THEN PRINT@Y,CHR$(RND(
26)+96);
30 PLAY"B-L200EF+":NEXTY,X
32 N=0
35 N=N+1
40 READQ$
41 PRINT@32,"";
50 Q$=Q$+" ":FOR R=1 TO LEN(Q$):
S$=MID$(Q$,R,1)
51 V=VAL(S$):IFV AND R=1 THEN PR
INT@31,"";
52 IF V OR S$=" "THEN S$=CHR$(12
8)ELSES$=CHR$(ASC(S$)+32)
53 PLAY"F":P$=P$+S$
54 IF S$=CHR$(128) THEN IF LEN(P
$)+POS(0)<33 THEN PRINTP$;:GOTO5
7
55 IF S$=CHR$(128) THEN PRINTSTR
ING$(32-POS(0),128);:PRINTP$;:P$
=""
57 NEXT
60 GOSUB70:IF N=3 THEN PRINT@427
,"the"+S$+"end"+S$+"end";ELSE IF
 N<3 GOTO35
61 GOTO61
```

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Type `NEW` and key in *Stutter 1*. Copy the listings very carefully. Be certain you press `ENTER` after the last letter of each of the 2000 series `DATA` lines. Do not leave a blank trailing space. Note that Line 2010 doesn't make sense but copy it as is. Run the program.

My original goal was to get a stammer-free display. In Line 50, insert in front of `GOTO 57`, `P$="":`. In Line 2010 insert `COCOSPACEBAR` immediately after `DATA` without leaving a blank space. Run your work.

To indent each line in Line 41, change `32` to `34` and run. Now, to get another stammer, restore Line 41 to `32`. In Line 55, change `32-` to `33+` and run. If desired, `CSAVE` now.

Type `NEW`. Key in *Stutter 2* for a modification and run. The stutter is too pronounced. To eliminate most of it, add at the end of Line 54 `:GOTO 57`. In Line 55, change `0+` to `32-` and run. For one final stammer, change Line 55 from `32-` to `8+` and run.

We gave CoCo some workout! Notice we did not use any punctuation. In order to use inverse punctuation marks, we must `POKE` them into the memory locations 1024 to 1535, which are equivalent to 0-511, (the Print @ screen). It is not practical to use them in this program.

That doesn't mean that it can't be done. As long as you can think of a problem, you are on the way to solving it. CoCo usually has the capability to solve it; the trick is to coax it into revealing its secrets.

`CLOAD` *Stutter 1* if you saved it, otherwise key it in again.

In Line 41, change `32` to `34`; in Line 54, insert in front of `GOTO 57`, `P$="";`; in Line 60, insert `GOSUB 500` at the beginning; and in Line 2010, after `DATA` insert `COCO SPACEBAR`.

Add the following lines:

```
58 P=POS(0)
500 IF P=13 GOTO600 ELSE IF
P=18 GOTO601 ELSE IF P=30
GOTO602
600 POKE1132,46:RETURN
601 POKE1105,46:RETURN
602 POKE1149,46:RETURN
```

OK, run your handiwork. How was the value of 'P' determined? On Line 58 `:PRINTP;` was added. Add this temporary modification and discover a useful programming trick.

The cursor locator, `POS(0)`, was placed right after a sentence was displayed. It was given a value 'P'. `PRINTP;` gave the value of the location of the cursor along the row, from zero through 31.

How was the `POKE` location figured out?

By guesstimation. One of several methods is to set the `POKE` at some arbitrary location such as 1100 in lines 600 through 602 and `POKE 46`, the inverse period at that location. It was tried and adjusted until it rested after the last character in the sentence.

A problem would arise if the same cursor location, `POS(0)`, was revealed to be the same value for two or more sentences, but on different rows. You might like to set up a problem and work it out. Being lazy, I would revise one or the other of the sentences to ensure I would get a new cursor location.

We worked with the screen cursor locator, `POS(0)`, and managed to create our usual useless but amusing programs. We got a bit more programming under our belts and stored some important notes in our reference notebooks. Not a bad day's work! ☐

```
70 PRINT@419,"press"+S$+"any"+S$
+"key"+S$+"to"+S$+"continue";
80 EXEC44539:FORW=32 TO448 STEP3
2:PRINT@W,STRING$(32,128);:NEXT:
RETURN
1000 DATA 116,104,101,128,115,11
6,117,116,116,101,114,101,114
2000 DATAMY TEETH CHATTER SO MUC
H WHEN I STUTTER THAT I HATE EVE
N TO TALK TO COCO
2010 DATAIS THE NAME OF A VERY F
RIENDLY COMPUTER
2020 DATAI LOVE TO HACK AWAY AT
MY COMPUTER ALL DAY AND NIGHT BE
CAUSE IT NEVER LAUGHS AT ME
```

Listing 3: STUTTER2

```
0 '<STUTTER2>
10 CLS0:FORX=9TO21:PLAY"L255O3EB
":READA:PRINT@X,CHR$(A);:FORY=11
 TO 21 STEP2
20 IF Y>X THEN PRINT@Y,CHR$(RND(
26)+96);
30 PLAY"B-L200EF+":NEXTY,X
32 N=0
35 N=N+1
40 READQ$
41 PRINT@32,"";
50 Q$=Q$+" ":FOR R=1 TO LEN(Q$):
S$=MID$(Q$,R,1)
51 V=VAL(S$):IFV AND R=1 THEN PR
INT@31,"";
52 IF V OR S$=" "THEN S$=CHR$(12
8)ELSES$=CHR$(ASC(S$)+32)
53 PLAY"A":P$=P$+S$
54 IF S$=CHR$(128) THEN IF LEN(P
$)+POS(0)<33 THEN PRINTP$;:P$=""
55 IF S$=CHR$(128) THEN PRINTSTR
ING$(0+POS(0),128);:PRINTP$;:
57 NEXT
60 GOSUB70:IF N=3 THEN PRINT@427
,"the"+S$+"end"+S$+"end";:PRINT@
481,S$+S$;:ELSEIF N<4 GOTO35ELSE
 IF N<3 GOTO35
61 GOTO61
70 PRINT@426,"PRESS"+S$+"ANY"+S$
+"KEY";
80 EXEC44539:FORW=32 TO479 STEP3
2:PRINT@W,STRING$(32,128);:NEXT:
RETURN
1000 DATA 116,104,101,128,115,11
6,97,109,109,101,114,101,114
2000 DATAMY TEETH CHATTER SO MUC
H WHEN I STUTTER THAT I HATE EVE
N TO TALK TO COCO
2010 DATACOCO IS THE NAME  OF A
VERY FRIENDLY COMPUTER
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```

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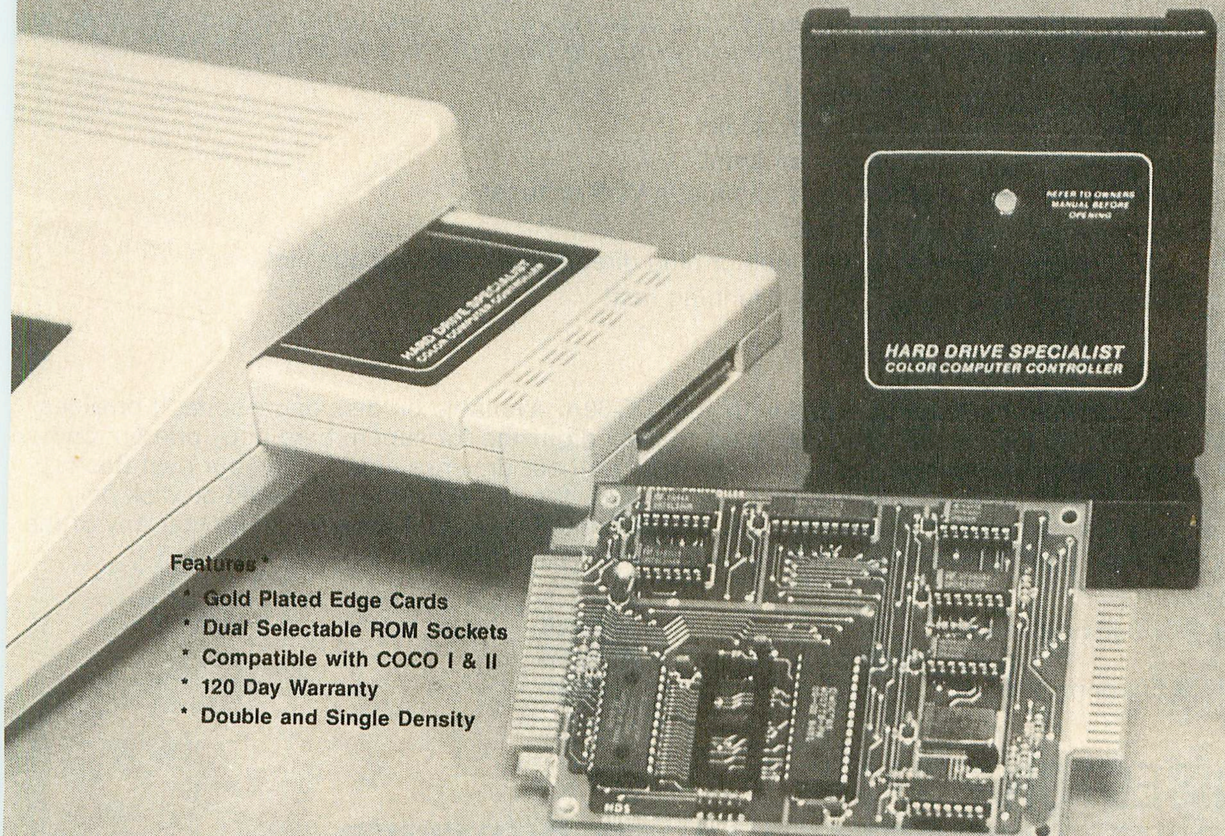
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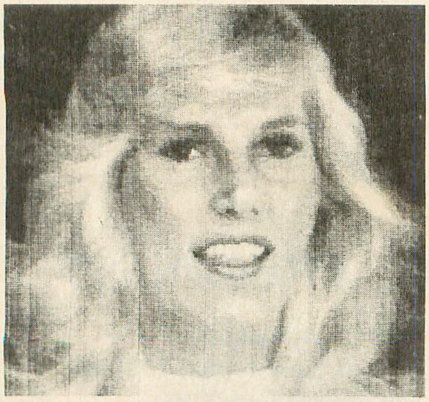
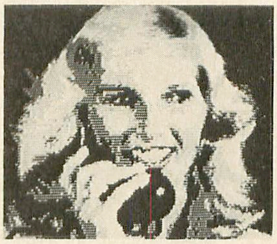


Printout



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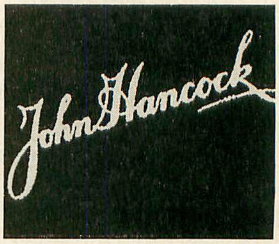

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Do-It-Yourself Video Output Board

By Tim McIntosh

I use my CoCo quite extensively on a daily basis. The bulk of my work revolves around word processing. I quickly discovered that using a television for a monitor was inadequate.

About a year ago, I began to look around for a monitor and a way to drive it. I was unaware of the many advertisers who market just such devices. So, I set out to build my own. The project presented here required about a half day's labor and $8 worth of parts.

As the schematic shows, this monitor driver requires two common transistors and a handful of support components. Most experimenters should have an abundant supply of these. The driver works with color as well as monochrome composite video monitors. The pin numbers given in the schematic refer to the MC6847 VDG chip in the Color Computer. The descriptions of these pins are as follows: Pin 1 — GND (signal ground); Pin 17 — Vcc (+5v DC); and Pin 28 — Composite video signal.

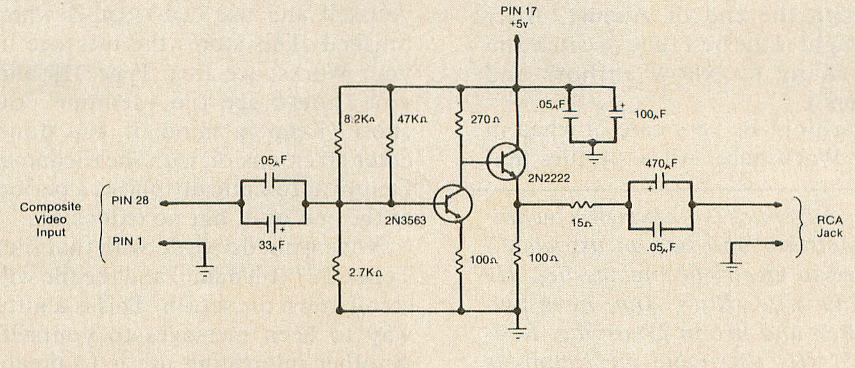
Construction of the driver is relatively simple. I used a small project board from Radio Shack to mount the components. I ran the connecting wires (any standard jumper wire will do) to the points on the circuit board where the 6847 is soldered. Be careful when counting to the proper pin locations. A mistake could damage your CoCo.

Many of you will want to run a length of shielded cable with an RCA plug on it out of the computer directly to the monitor. I chose to tidy up the project by mounting an RCA jack on the back of the CoCo and running the shielded wire to this. Not only did this improve the appearance of the project, but I can now relocate my CoCo without trailing a mess of wires behind me.

Although I use this new monitor driver on a CoCo 2, it should work on any Color Computer as well. Remember: Opening your CoCo voids the warranty. It is not advisable to attempt this project without some prior knowledge of electronics.

(Any questions you may have about this project can be sent to the author at 416 Oak St., Greenville, AL 36037, 205-382-7358. Please enclose an SASE when writing.)

Video Board Schematic



108 123A

Tim McIntosh is a minister for a small congregation in Greenville, Alabama. He is an amateur programmer and uses his CoCo for office applications.

DELPHI BUREAU

A Look At Workspace

By Cray Augsburg
Rainbow's CoCo SIGop
Username: RAINBOWMAG

Let's continue our trek into the database. Last month, we discussed some of the technical aspects of file transfers as well as methods of downloading. Before we cover methods of uploading, we need to learn about the "Workspace."

Personal Workspace

Delphi gives each user a personal area known as Workspace. It's a chunk of memory on the Delphi computer that belongs solely to you for as long as you are a member. There are two ways to get to your personal Workspace: from a database topic area type `WO` or, thanks to **Jim Reed** (JIMREED), type `WO` from the main CoCo SIG menu.

(Jim, our CoCo SIG manager, also persuaded Delphi to adopt lower "Late Rates," in effect now through the end of August. After midnight is the best time to catch Jim and many RAINBOW authors and editors.)

Warning! Be very careful when in your Workspace. All setup files that connect you with Delphi reside there. The logon default settings you chose for screen width and length, prompt level, etc. are stored there. If they are deleted, they are troublesome to replace. All of your Mail folders and new Mail messages are kept in files in your Workspace. Be careful not to alter any Workspace files that you yourself did not create or upload.

So, now you're in Workspace. What do you do? First, type `DIR`. This gives a complete listing of files stored there. Now, type ? and press ENTER. You should see a list of commands. One interesting command is called `CREATE`. If you type `CREATE`, you are prompted to provide a filename. Then, you are asked to enter text and do a CONTROL-Z when finished, or CONTROL-C to abort. Try it! Type a message to yourself and use CONTROL-Z when finished. This stores the message in your Workspace area. Type `DIR` and you should see the filename you chose. Keep in mind, if you don't enter an extension with the filename, Delphi automatically places a period at the end of it, but no extension.

Now, what do we do with that file? Type `LIST` (filename) and the file will scroll down the screen. This is a nifty way to keep messages to yourself. Another interesting use is to create files in this manner to be sent via Mail. When you are in Mail, type `SEND` "filename" and that file is sent to the user you specify. If you want to alter a file, type `EDIT` "filename."

Did you notice some strange looking filenames when you typed `DIR`? These names have the letters "MAI" in them and are extra long. These are Mail files. To see your directory without these filenames, use the / exclude option with the `DIR` command. Just type:

```
DIR /EXCLUDE=*.MAI
```

Notice that your directory is in alphabetical order. Delphi automatically alphabetizes the files in Workspace.

Another useful Workspace command is `DELETE`. Type this on its own command line and Delphi prompts for the filename to delete. Another method is to type the filename on the command line in the form:

```
DELETE "filename"
```

Either way, Delphi lists the filename to the screen and asks for confirmation to delete the file. Answer with 'Y' or 'N' followed by ENTER.

Let's try an experiment. Use `CREATE` to build another file with the same filename used before. When finished, use CONTROL-Z to save the

---

Cray Augsburg is RAINBOW's technical assistant and has an associate's degree in electrical engineering. He and his wife, Ruth Ann, have two children and live in Louisville, Kentucky. His username on Delphi is RAINBOWMAG.

file. Type `DIR`. You should now see both files in the directory listing. Why didn't the second file overwrite or replace the first file? Delphi allows multiple versions of the same file in your Workspace.

Look at the end of the filenames in the listing. You should see a semicolon followed by a number. This number is the version number. This allows you to create or upload several versions of the same file. If you use the `DELETE` command to delete any of these files, you are prompted for each version number separately. In this way, all versions of the same file can be deleted once you have the final, bug-free version. However, there is an easier way; type `PURGE` (filename). This deletes all versions of the file except the most recent.

To put a file created offline in the Workspace is easy. Just upload them to the system. All files you want to upload to Delphi, whether for your own use or for posting them publicly, must be uploaded to your Workspace before anything else can be done with them.

Uploading Files

By far the easiest and most reliable method for uploading is by the use of the "Xmodem" protocol. The reasons for this were discussed last month. Before starting an Xmodem upload, make sure the file is loaded into your terminal program's buffer. It doesn't matter whether the file is in ASCII or binary format. When you are sure the file is in the buffer, initiate the Xmodem upload by typing `XUPLOAD` or just `XUP`. Delphi prompts for the filename. Enter the filename as you want it to appear in your Workspace. Do include some form of extension. Next, Delphi asks if the file is a text file. This is really asking if the file is in ASCII or binary. Enter `Y` if the file is ASCII or `N` if the file is binary. It is essential you answer this prompt correctly!

Delphi tells you to type three consecutive CONTROL-Cs if you want to abort the upload at this time. It also says `OK, send! (blocked)`. If you told Delphi you are sending an ASCII file, the word "blocked" is replaced with the word "text." Now, go to your terminal program's command mode (CONTROL-7 on *Mikeyterm*) and initiate Xmodem upload there (use CONTROL-3 on *Mikeyterm*). Your terminal program should ask if the file is ASCII. Answer 'Y' or 'N' according to what you told Delphi. Again, answer this prompt correctly.

When file transfer is complete, the `WO>` prompt returns. You should see the words `FINAL STATUS = Transfer Successful` on the screen.

If your terminal program does not support Xmodem protocol, you are limited to uploading only ASCII files. To perform an ASCII upload, load the file into your buffer. Then go to Workspace and type `UPLOAD` or just `UP`. Delphi asks for the filename. Answer this prompt as explained. Delphi will ask if you want a linefeed sent to your terminal program after each line uploaded. In most cases a "no" answer works fine. You may have to experiment with this. Delphi then tells you that the lines of text in the program you are uploading should be terminated with a <CR> only (they should not end with a <CR> and linefeed). Then you will be prompted to enter (or send) the data. Go to your terminal package's command mode and "send" the buffer. This is done with CONTROL-9 on *Mikeyterm*. Terminate the upload with a CONTROL-Z or you may abort it with a CONTROL-C.

Use `HELP` to find out more about the other commands.

Next month, we'll cover more Workspace commands and dive into the specifics of submitting a program. If you are brave, though, you may want to give the `SUBMIT` command a try. It really isn't all that difficult.

Free Time

As Marty says in his report this month, our offer of free time for uploading programs to the CoCo SIG has been quite successful. Several members have taken advantage of this offer. If you have programs to submit and would like a little time to do so, go to the Questions section of the SIG and `READ` the article on free time. You will be prompted for the information to set you up.

On Other Matters

Several members of the CoCo SIG chose not to give their real names or their complete names when they first joined the SIG. There is a command users can issue when at the main CoCo SIG prompt that will tell them the real name for a given username. Type:

```
ENT username
```

and replace "username" with your username. Delphi will tell you the name you used when you joined the SIG and will also report the last time you were on the system. You can use this to find the real name for any member, provided they have supplied their correct name. Please use the `ENT` command to see how your real name is recorded. If you are not satisfied with its appearance, let Jim Reed or me know via Mail. We will alter it accordingly.

On a related matter, several new members have joined our SIG. Many of them have not filled out a user profile. Please, if you have not done so, go to the Member section of the SIG and fill out a profile. Also, go

Database Report

By Marty Goodman

By the time you read this, it is very likely the NEW Color Computer will have been announced, and the Delphi CoCo SIG will be buzzing with information about it. Its arrival will profoundly affect the extent of our support for OS-9, as the new machine is rumored to be oriented nearly exclusively to the use of that operating system.

I want to extend a special welcome to **Don Hutchison** (DONHUTCHISON), who has officially joined our staff on the Delphi RAINBOW CoCo SIG. Don is an experienced electronics professional, with excellent knowledge of both hardware and software. He has been active for years on CompuServe and, some months ago, became a fixture on Delphi. Don is now the section leader for our Source Code for 6809 Assemblers section and will, in general, be assisting with all uploads to the database. If you submit a file to us, it is quite possible that it will be Don who has the pleasure of checking it out, enabling it and thanking you for it. He is available in our Forum (message base) area to assist with questions. Over the years, I have grown to appreciate both his knowledge and wry sense of humor, and so am delighted he has joined our family.

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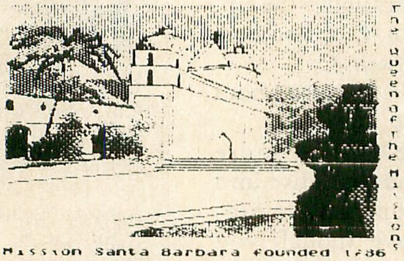

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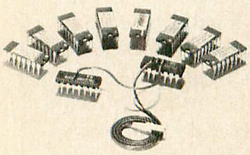

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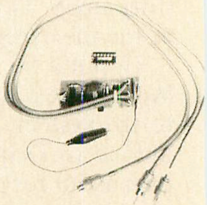

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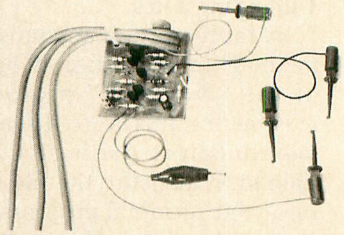
DOUBLE DRIVER II



Finally a monitor driver for the Color Computer II that lets you use a monochrome and a color monitor simultaneously. We're proud of this new driver. The six transister circuit provides optimal signal mixing and signal gain. Excellent monochrome output and better quality resolution in the color ouput than any driver we have seen. Audio output also. Fits all models of the Color Computer II. $29.95.

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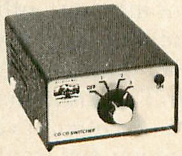

The CoCo Switcher allows you to hook up three peripherals to your RS-232 jack. Connect your modem, printer and any other RS-232 compatible peripheral to the CoCo Switcher. An LED on the CoCo Switcher shows if your computer is on or off at a glance. The LED flickers when transmitting or receiving data.

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to the main Delphi menu and select People on Delphi and fill out a profile there. Once you have done this, other members can type:

`/WHOIS` username

and find out a little background information on you.

Editing in Mail

When you are going to send a Mail message, type `SEND/EDIT` or `REPLY/EDIT` appropriately. This puts you in the editor for creating a message. In this way you can edit the message fully before sending it.

Freedom for Montreal Members!

Andre Mallette (MODEMITIS) has given us a little tidbit that could be important to members in the Montreal area. Now those people can access Delphi through Tymnet by dialing 748-1051. At the "terminal identifier" prompt press 'A'. When asked to log in, enter `DELPHI`. You can then proceed with username and password. Not only will this reduce connect costs, but you will have much less trouble downloading programs using the Xmodem protocol.

Outside Support

Many thanks to **Scott Lampton** of Sullivan, Indiana. Although Scott has been unable to join us online, he wanted to show support by sending in some files for uploading to Delphi. Scott sent three files in answer to our call for music files. You can now find *Snowbird*, *Almost Like a Song* and *You and I* in the Music database. Again, we thank Scott for his support of a service he is presently unable to enjoy.

Late Rates

Are you having trouble getting to sleep on those hot summer nights? Maybe you are thinking about Delphi. Delphi is definitely thinking of you! As mentioned earlier, until August 31, 1986, Delphi is offering "Late Rates." From 2 a.m. EDT until 7 a.m. in your local time zone, you will receive one free minute of access time for every ten minutes online. That's six free minutes for every online hour for Conferences, Delphi Mail, downloading files and accessing information — everything you use Delphi for. Take advantage of this offer.

We have successfully initiated our program on the SIG of offering *free* connect time for those who want to upload material to us. Several members have already taken advantage of this. If you have material to upload to us, go to the Questions & Feedback area from the CoCo SIG main prompt, and select the form that is a "Request for Free Upload Time." You will be asked why you want the time, when you want it and you will be informed of the terms of this offer. If the request is approved (it usually is), you will be notified via Delphi Mail. We typically give you time to upload material and a little left over for you to briefly browse around the SIG, as our way of saying thank you for helping us out.

In June, the greatest number of new uploads were to our Graphics database. **Ira Goldwyn** (IRAG) has been very busy using his newly acquired 1200 Baud modem to send us nearly a hundred new pictures. **Derrick Kardos** (DTG) has supplied us with a BASIC program that generates logos of popular rock groups. **Roger Bouchard** (HARBIE) has provided us with some routines for the Epson for printing teletype, text-type printer art. He also has given us some lovely animal pictures and some digitized scenes from *Tron*. **Steve Hancock** (KA4ULE) has contributed a picture of a CoCo. **Loren J. Howell** (XENOS) has given us a simple BASIC utility for drawing using the eight-color high resolution semigraphics-24 mode.

In the Hardware Hacking database, Roger Bouchard has sent us a review of the Hitachi 6309, a CMOS, 3-MHz-capable version of the Motorola 6809. He has also sent us schematics and instructions for several hardware projects. **John Beveridge** (JOHNTORONTO) has given us both text and pictures describing the use of Motorola gas discharge surge protectors. It is from him that I learned of these devices, and was able to mention them in my "CoCo Consultations" column (Page 178) this month. Don Hutchison and I have uploaded a much-revised version of a set of pictures and instructions on how to build a simple but effective dual or triple voltage linear power supply (+5, +12 and -12 volts). We provide full schematic diagrams and an extensive description of how it all works. This circuit has the desirable property of using a minimum of components to develop all those regulated voltages.

Our Music topic area is beginning to grow. **Erik Gavriluk** (ERIKGAV) has given us a Random Music generator. Don Hutchison has provided us with a couple of new songs: "Country Roads" and "The Way You Are." **George McCashin** (GMCC) has sent us both the *PLAY.BIN* program that plays *Musica II* files, documentation for same, and an assortment of *Musica II* compositions. We eagerly solicit uploads of more music material, and offer free connect time to help facilitate getting the data to us.

Our Source Code for 6809 Assembers topic area has been enriched by a Disk Editor program from **Edward Coen** (EDCOEN). Don Hutchison has contributed two sets of source code for graphics dumps to Epson LX and other printers. **Ronald Cole** (RONALDCOLE) has given us source code for a 32K Printer Spooler.

In the Utilities database, **Eric Tilenius** (TILENIUS) has given us an envelope addresser and a logarithm program. **Dave Archer** (DAVEARCHER) has sent a disk directory database program. **Steve Hancock** (KA4ULE) has provided a multiplication table drill progam, and **Rodger Alexander** (SALZARD) has contributed a monthly report card program. **Mike Brant** (MBRANT) has given a conversion table utility.

In our Games topic area, **Richard P. Trasborg** (TRAS) has uploaded *Pinball*, and **Ronald Cole** has sent us a game called *Escape2*. **Michael Schneider** (MSCHNEIDER) has given us *Slot Machine*.

To the Product Reviews section **Denny Skala** (DENNYSKALA) has contributed a comprehensive and professional review of the OS-9 word processor, *The Last Word*.

Our Data Communications area has been enriched by **Rob Wyatt's** (ROBERTJR) *Dazzelterm*, a terminal program oriented to transmission of images and sound. Roger Bouchard has given us *DCM16*, a dedicated disk transfer program.

The OS-9 topic area now features two new graphics demo programs by **Steve Bjork** (6809ER), one similar to the familiar Amiga bouncing ball demo, and one which *outdoes* the Amiga demo by depicting *many* bouncing balls. Steve has also given us a line feed remover program.

Our thanks to all of you who have helped our database grow. See you all on Delphi!

— Marty
(MARTYGOODMAN)
Delphi CoCo SIG Database Manager

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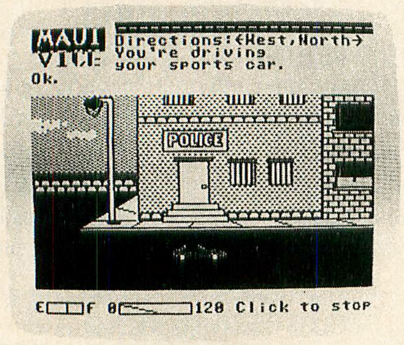

Directions:{West,North}
You're driving your sports car.
Ok.

New Release

Maui Vice

Step into the shoes of Crockett & Tubbs, and gather evidence, photographs and witnesses to convict your suspects! With "windows" to select your options, hi-res graphics, and a new story generated each time you play. This is state-of-the-art that guarantees excitement and newness every time you play.

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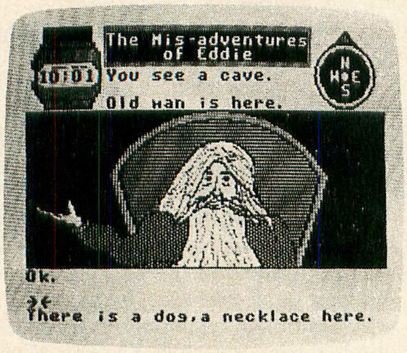
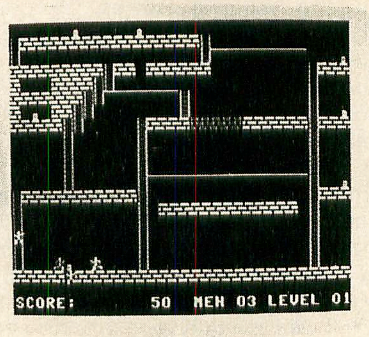


You see a cave.
Old man is here.
Ok.
There is a dog, a necklace here.

The Misadventures of Eddie

Another great Novasoft adventure. The ol' man in the mines' rebellious son, Eddie, is roaming through time, creating havoc—and you must bring him home in order to return to your own time! Over 140 locations, 50+ commands, in hi-res graphics. Experienced adventurers will love this one!

Requires 64K
Disk $21.95



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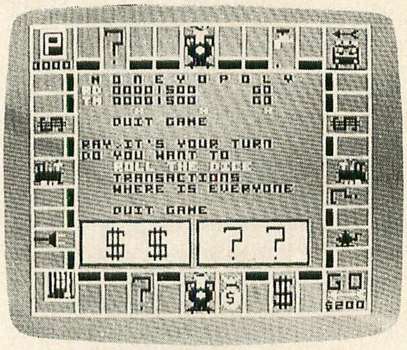

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TRANSACTIONS
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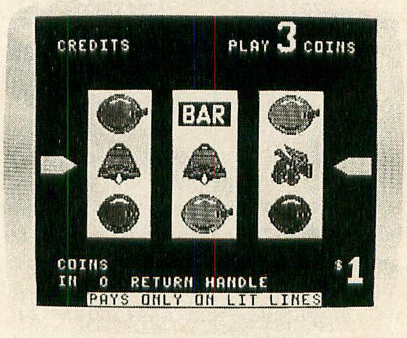

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CoCo Crosswords—Master set has 27 puzzles, four levels of difficulty. Pull down menu. Additional sets have 30+ puzzles each.

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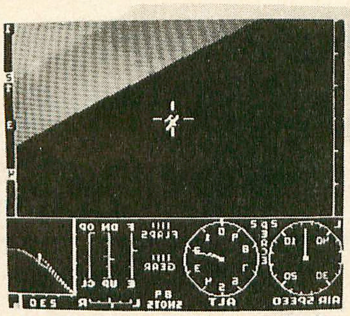
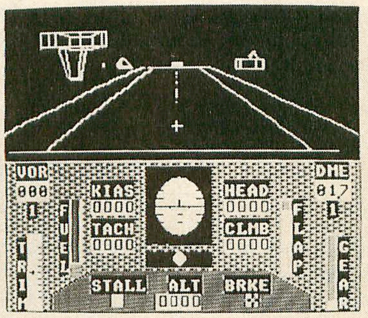


P-51 Mustang Attack/Flight Simulation

The ultimate video experience! Link two CoCo's together by cable or modem, and compete against your opponent across the table OR across the country! (Both computers require a copy of this program). The P-51 flight simulator lets you fly this WWII attack fighter in actual combat situations—against another player OR against the computer.

32K Machine Language
Flight Manual Included
Tape $29.95 Disk $34.95



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Real-time simulation generates panoramic 3-D views of ground features as you fly your sophisticated plane in any of nine different "worlds." Program models over 35 different aircraft/flight parameters. Realistic sound effects too! Manual included helps you through a typical short flight.

32K Machine Language
Flight Manual Included
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32K Ext. Basic
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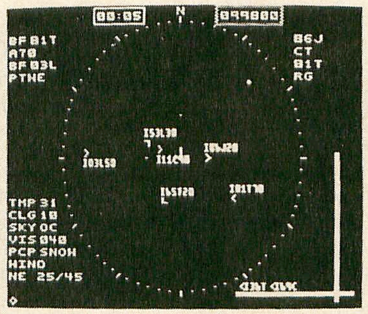

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To 'Y', or Not to 'Y'?

By Marty Goodman

In the second installment of "CoCo Consultations," the following are all questions that have come from users of RAINBOW's CoCo SIG on Delphi. These have been asked either in the CoCo SIG forum or via Delphi Electronic Mail.

- *I installed a 'Y' cable on my disk drive and now it acts up sometimes. I really don't have room for a multipack and would prefer not to get one. What can I do?*

(TRASS)
Tom Rasmussen
Davenport, IA

You probably *do* need a multipack. The naked CoCo system bus (the signals available at the ROM pack port) are often too weak to drive two devices. The multipack provides buffering and amplifying circuitry. The extra device on the 'Y' cable can also overload the power supply. Sometimes 'Y' cables work with some hardware combinations, but often they result in intermittent disk malfunctions. Keeping the 'Y' cable short (under three inches) increases the chance it will work properly. I recommend using a multipack when you need to run two or more plug-in cards.

- *Are the old gray multipacks any different from the old white multipacks or from the newer small white ones?*

(IRAG)
Ira Goldwyn
Great Neck, NY

All multipacks should be interchangeable. The new white ones use different (more advanced and less expensive) circuitry than the older ones, but should behave identically to the older variety.

- *My modem and RS-232 Pak were fried by either the telephone company or lightning. What precautions can I take to prevent this?*

(THEPROFESSOR)
Richard Steinbrueck
Brandon, FL

By placing MOVs (Metal Oxide Varistors) rated at 130 volts, 220-volt dual Zener Diodes, and/or 250-volt Gas Discharge Tubes in parallel with your incoming phone line, you can significantly decrease the chance of spikes harming equipment. Several commercial firms sell surge protectors for the phone line that use some of those devices. None of these measures guarantees protection from a direct hit by lightning.

- *Is there any reason why I should get an RS-232 Pak, other than allowing me to run at 1200 Baud? Why is the bit banger port alleged to be unsuitable for 1200 Baud telecommunications when I use it at 4800 Baud to talk to my printer?*

(RRIES)
Richard Ries
Copiaque, NY

- *I understand* Mikeyterm *supports the Radio Shack RS-232 Pak at Baud rates above 300. How does this work if one only has a 300 Baud modem? If a modem that can work at greater than 300 Baud is needed to operate at speeds greater than 300 Baud, what advantage does the RS-232 Pak offer?*

(GMCC)
George McCashin
Chattanooga, TN

The RS-232 Pak allows you to leave the printer connected while online, and you'll find it more convenient to print out what you receive online. As the price of 1200 Baud modems continues to decrease, the Pak will be more useful. Under OS-9, you will not be able to hook a terminal to the system unless you use a hardware RS-232 (RS-232 Pak). You cannot use 1200 Baud even though your terminal and RS-232 Pak support such speeds. You must have a modem that can also handle such information speeds.

When the computer uses the bit banger to talk to the printer, it is only sending data to the printer. It is not receiving. This is simplex communication. When the port is being used to talk to a modem, it is called upon to send and receive data simultaneously. In simplex mode, the bit banger has no trouble talking, even at 9600 Baud.

- *Is there any advantage to replacing the 'E' board's original SAM (74LS783) with one of the new 74LS785 type SAM chips? Is there any reason to replace the 6821 on an 'E' board with a 6822? I have heard the 6847 VDG has been replaced with a newer, more efficient chip. Is this true?*

(BUGMAN)
Harold Dowda
Columbia, SC

The newer 74LS785 SAM chip timing has been arranged more precisely to fix some problems associated with some older SAM chips. It runs cooler than its predecessor. It supports 256 cycle refresh four-bit wide dynamic RAM chips in addition to the older one-bit wide 128 cycle refresh RAM chips used in the older CoCos. If you are having intermittent crashes that you trace to a bad SAM chip, I recommend the 74LS785 (which is backwards compatible to the machines using the 74LS783). But if you are not having problems related to the SAM,

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. Marty is the database manager of RAINBOW's CoCo SIG on Delphi. His noncomputer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

leave it alone. The new SAM is Radio Shack number MX 6433.

The 6822 is not a drop-in replacement for the 6821. Do not consider putting it into your 'E' board computer. Although the descriptions of the pins are the same for both the 6822 and the 6821, the 6822 uses open collector gates on the output for one of its two ports. Conversion is a tedious job, and not necessary.

The 27-3134B model CoCo used a variant of the 6847 called the 6847-T1. This chip behaves much like the older VDG, but it has support for true lowercase as well. It is not easily installed in older model CoCos.

- *I have a new model J & M controller with a built-in parallel port. I am using OS-9 at present. My old Disk BASIC programs will not print out through that port. What can I do? Can I format new disks under OS-9 and copy Disk BASIC formatted disks?*

(BONIE)
Mike Bonie

Sorry, but that parallel port demands special driver software to be custom installed in most Disk BASIC applications programs to use it. OS-9 is much better suited for adding hardware like the parallel port, because all programs designed to run under it must speak to their ports through device drivers and descriptors.

Although OS-9 and Disk BASIC use similar fundamental disk formats (both use 256-byte sectors and 35 tracks, and use the same numbering of their sectors and tracks), there may be problems using one to back up the other's disks. If you are using OS-9 configured for 35-track, single-sided disks the `DSKINI` and `BACKUP` commands will make an exact copy of an OS-9 disk. If you are using 40-track and/or double-sided drives under OS-9, and have the OS-9 configured for the same, you will run into problems. Best keep things under one operating system.

- *I'm starting my own BBS and need an auto-answer modem. I own a DC-3 from Radio Shack. Can you tell me how to use it for auto-answer?*

(CGR)
Christian Ross
Williamsport, PA

The DC-3 does not support auto-answer. A while ago, RAINBOW ran an article on how to convert a DC-1 modem to allow it to auto-answer. If you are an experienced hardware hacker, that conversion could probably be adapted to the DC-3. But my advice is such a conversion would be a waste of time and money, considering the low price these days of auto-answer modems.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P.O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

For quicker response time, your questions may also be posted in the FORUM section of RAINBOW's CoCo SIG on Delphi. In FORUM, type `ADD` and address your questions to the username MARTYGOODMAN. Marty is on most every evening to respond to FORUM messages. Other CoCo SIG members may also reply to questions posted in this public message area. Please be sure to leave your name and address in any FORUM questions, since those of wide interest will be selected for publication in this column.

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The last installment of the point-and-pick interface

CoCo Mouse: The Final Chapter

By Steve Bjork

To refresh your memory, *The Mouse* is an assembly language program that displays and moves a cursor and prints upper- and lowercase text on the Hi-Res graphics screen. A BASIC program may access this interface by 13 user functions and the PRINT command.

Last month we covered the assembly language side of the USR function and PRINT command, along with the code for drawing the cursor (pointer). We also looked at how the joystick and button information is polled.

This month we have the second half of the source code, bell and clock sounds and the Hi-Res screen text driver and its character shape data.

Before getting started I want to remind you that *The Mouse* and its source code are copyright 1986 by SRB Software with all rights reserved. It is presented in RAINBOW magazine for private use only, and can't be used (all or part) in any marketed product without written consent from SRB Software.

Makin' Some Noise!

The first subroutine of Listing 1 (MOUSE3/ASM) generates the bell sound used in function 7. The bell sound is generated by playing a steady tone that decreases in volume as it is played (see Figure 1).

So the sound can be heard, the bell routine first enables sound to the TV and selects the six-bit DAC as the sound device by calling SNDON. Next, the interrupts are disabled so the timing loops are not distorted and the starting volume is selected.

Lines 600 to 1900 generate the envelope in Figure 1. After bell sound is completed, the interrupts are turned back on and the TV sound is disabled.

The click sound does not change in volume like the bell, but does become lower in pitch as it is played. With click being so fast, the interrupts do not need to be turned off as before. Lines 4600 through 5400 flip the bits of the six-bit DAC with a longer delay each time to generate its wave form.

PRINT @

The Hi-Res screen text driver has 32 characters per line, just like the standard green text screen. But eight lines must be added to make a total of 24 and give an extra 256 positions. This does present a little problem; the PRINT command's '@' can't address these new lines. So *The Mouse* intercepts the PRINT command to handle the '@' function for screen location in NPRINT, lines 6300 to 9400 of Listing 1.

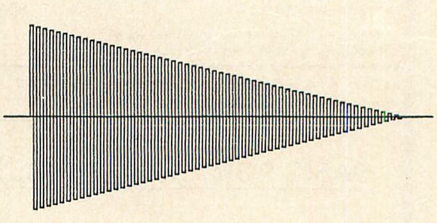

Figure 1: Bell Sound

NPRINT jumps to the old PRINT command vector (in OLDPRT) if there is no '@' after the word PRINT. If there is an '@', a 16-bit number subroutine of Color BASIC ROM is called to find the new location. If this number is larger then the window size, then an FC Error is generated. With everything OK, the cursor is moved to the new location and

---

Steve Bjork has been a programmer for over 15 years. In his association with Datasoft he has authored such programs as Zaxxon, Sands of Egypt *and* Mega-Bug. *He now handles product development for his own company, SRB Software, and has produced* Stellar Life Line, Ghana Bwana *and* PitFall II *among others. Steve lives in Simi Valley, California*

Pattern	Binary	Hex	Decimal
...***..	00011100	$1C	28
..*...*.	00100010	$22	34
..*.....	00100000	$20	32
...***..	00011100	$1C	28
......*.	00000010	$02	2
..*...*.	00100010	$22	34
...***..	00011100	$1C	28
....	00000000	$00	0

Figure 2: Dot Format for 'S'

the old `PRINT` command handles the rest of the line.

Outgoing Intercepters

All characters that would normally go to the text screen are intercepted by *The Mouse*. This is done by redirecting the standard output path through SPRINT at Line 10500. This routine calls CHR (Hi-Res text driver) if a Hi-Res graphics screen is selected. If a Lo-Res graphics or text screen is displayed at the time, then the old standard output path is used.

The routine that prints a character to the Hi-Res screen, CHR, must first decide what mode it is in. These modes are Standard, Set Cursor Position and Set Window. Standard prints the character, does a control code or sets up the other two modes. Set Cursor Position mode takes the next two characters (X and Y position) and moves the cursor (lines 13600 through 15100). The Set Window mode takes the next four characters and sets up a new scroll-protected window (lines 10400 through 15400 of Listing 2).

Standard mode first tests if the character is a control code, 0 to 13, with CHRTAB holding the offset vector for these routines. Some of the routines are Line Feed, Clear Screen, Carriage Return, Set Window and Set Cursor Position.

Next is a test for displayable range (32 to 127). If it is in range, then the character's shape is selected out of CHRDAT shape data. The Shape Data format is one byte (eight dots) wide and eight bytes (lines) high.

MOUSE4/ASM (Listing 2) is the CHRDAT shape data table for all 96 displayable characters. Each character shape consists of one byte (eight dots) wide by eight bytes (scan lines) high. If the bit is a zero, then a black dot is placed on the screen. And of course, if the bit is a one, then a white dot is displayed. Dot format for the letter "S" is shown in Figure 2.

Each line of the CHRDAT shape data table has eight bytes (four word length) per line. Some assemblers do not allow for more then one expression per line. If this is the case with your assembler then all 96 FDB lines must be replaced by four FDB lines with one expression each.

That's all the source code. If you have any questions about *The Mouse* or its source code just drop me a line, or better yet, look for me (6809er) at RAINBOW's Color Computer SIG on Delphi.

(You may contact Mr. Bjork at 2529 Ellington Court, Simi Valley, CA 93063. Please enclose an SASE when writing.) ☐

Listing 1:

```
00100 * SOUND AND SCREEN DRIVERS
00200 PING    BSR     SNDON             GET SOUND FROM 6 BIT DAC
00300         PSHS    CC                SAVE IRQ FLAGS
00400         ORCC    #$50              TUEN OFF IRQS
00500         LDA     #230              HOW LONG TO DO SOUND
00600 PING1   BSR     PING5             DO A TIME DELAY
00700
00800         TFR     A,B               GET TIME COUNT
00900         ANDB    #$F7              USE ONLY THE TOP 5 BITS
01000         ORB     #2                SET PRINTER BIT HIGH
01100         STB     $FF20             SEND IT OUT THE DAC PORT
01200
01300         BSR     PING5             DO A TIME DELAY
01400         LDB     #2                CLEAR ALL BITS BUT PRINTER
01500         STB     $FF20             ON DAC PORT
01600         DECA                      MAKE BALL SOUND SMALLER
01700         DECA                      BY 2
01800         CMPA    #18               IS BELL DONE?
01900         BHS     PING1             NO, THEN LOOP
02000         PULS    CC                TURN ON IRQS
02100 SNDOFF  LDA     $FF23             TURN OFF DAC SOUND
02200         ANDA    #$F7              BY RESETTING THE BIT
02300         STA     $FF23
02400         CLRB                      MAKE RETURN ZERO
02500         RTS                       AND RETURN
02600
02700 SNDON   LDA     $FF23             TURN ON THE SOUND BY
02800         ORA     #8                SETTING THE SOUND ON BIT
02900         STA     $FF23
03000         LDA     $FF01             GET LSB OF JOY/AUDIO
03100         ANDA    #$FF-8            PORT AND RESET IT
03200         STA     $FF01             AND PUT IT BACK
03300         LDA     $FF03             GET MSB OF JOY/AUDIO
03400         ANDA    #$FF-8            PORT AND RESET IT TOO
03500         STA     $FF03             AND PUT IT BACK
03600         RTS                       NOW EXIT
03700
03800 PING5   LDB     #180              TIME DELAY USED BY BELL (PING)
03900 PING6   DECB
04000         BNE     PING6
04100         RTS
04200
04300 *MAKE A SMALL CLICK SOUND
04400 CLICK   BSR     SNDON             TURN SOUND ON TO DAC
04500         LDA     #10               START TIME DELAY SHORT
04600 CLICK1  TFR     A,B               DO A DELAY (USE COUNT)
04700 CLICK2  DECB                      GET LONGER EACH TIME
04800         BNE     CLICK2
04900         LDB     $FF20             GET DAC PORT
05000         EORB    #$F0              FLIP TOP 4 BITS
05100         STB     $FF20             SAVE SET PORT
05200         INCA                      MAKE DELAY LONGER
05300         CMPA    #76               ALL DONE?
05400         BLO     CLICK1            NO, LOOP BACK
05500         BRA     SNDOFF            ELSE SOUND OFF AND EXIT
05600
05700 FNERR   LDB     #4*2              GO HERE FOR ?FN ERROR
05800         FCB     $8C
05900 SNERR   LDB     #2                GO HERE FOR ?SN ERROR
06000         JMP     $AC46             JUMP TO ERROR (OF BASIC)
06100
06200 *MOUSE'S NEW PRINT COMMAND
06300 NPRINT  BEQ     OPRINT            SKIP IF NO PRINT DATA
06400         CMPA    #64               IS THE FIRST CHAR. A "@"?
06500         BNE     OPRINT
06600         PSHS    A
06700         LDA     $FF22             GET GRAPHICS MODE
06800         ANDA    #$E0              IS SCREEN A PMODE 3 TO 4
06900         EORA    #$E0
07000         PULS    A
07100         BNE     OPRINT            NO, THEN USE OLD PRINT COMMAND
07200
07300         JSR     $B3E4             GET VAL FOR THE @ POSITION
07400         PSHS    U                 SAVE U, NEED FOR VARIABLE BLOCK
07500         LEAU    DATA,PCR          GET VARIABLE POINTER
07600         CLR     COUNT,U           CLEAR LINE COUNT
07700 AT1     INC     COUNT,U           ADD ONE TO LINE COUNT
07800         SUBB    WDXLEN,U          SUB ONE LINE WIDTH
07900         SBCA    #0                (DO 16 BIT SUB)
08000         BCC     AT1               LOOP TILL NEG
08100         ADDB    WDXLEN,U          ALWAYS ONE TOO MANY
08200         LDA     COUNT,U           GET LINE COUNT
08300         DECA                      ALWAYS ONE TOO MANY
08400         CMPA    WDYLEN,U          IS THE LINE OUT OF THE WINDOW
08500         BHS     FNERR             FM ERROR IF OUT OF RANGE
08600         STD     YCPOS,U           SAVE THE LINE & COLUMN POSITION
08700         PULS    U                 RESTORE U REG.
08800
08900         JSR     $A5               GET NEXT CHAR.
09000         BEQ     OPRINT            END IF END OF PRINT DATA
09100         CMPA    #$2C              IS THE CHAR. A ","?
09200         BNE     SNERR             NO, THEN ?SN ERROR
09300         JSR     $9F               SET FLAGS FOR CHARACTER
09400 OPRINT  JMP     [OLDPRT+DATA,PCR]
09500
09600 PMTAB   FDB     CHR1-PMTAB        TABLE USED FOR PMODE TYPE
09700         FDB     PMODE1-PMTAB
09800         FDB     PMODE2-PMTAB
09900
10000         FDB     WMODE1-PMTAB
```

The Crossword Creator Contest

Can you create a totally symmetrical crossword puzzle using the *Word+* program and the specifications outlined in the accompanying article on Page 38 of the May 1986 issue of THE RAINBOW? If so, you may wish to enter The Crossword Creator Contest. And, if we choose to print your crossword puzzle, you will be awarded a special prize.

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```
10100        FDB     WMODE2-PMTAB
10200        FDB     WMODE3-PMTAB
10300        FDB     WMODE4-PMTAB
10400
10500 SPRINT PSHS    B                  SAVE IT'S DATA, I NEED TO USE IT
10600        LDB     $FF22              GET SCREEN MODE
10700        EORB    #$E0               COMPLEMENT HI-RES BITS
10800        ANDB    #$E0               ONLY USE THOSE BITS
10900 * IF THE SCREEN IS IN THE HI-RES (6K) MODE THEN B=0
11000
11100        ORB     $6F                GET I/O PATH NUMBER
11200 * IF THE I/O PATH IS THE SCREEN (ZERO) THEN B STILL WILL BE ZERO
11300
11400        PULS    B                  GET B OLD DATA
11500        BEQ     SPRNT1             SKIP IF FOR HI-RES SCREEN
11600 SPRNT0 JMP     [OLDIO+DATA,PCR]           ELSE USE OLD I/O PATH CALL
11700
11800 SPRNT1 LEAS    2,S                REMOVE PATCH-CALL ADDRESS
11900
12000 CHR    PSHS    U,Y,X,D            SAVE ALL REGS.
12100        LEAU    DATA,PCR           GET ADDRESS OF VARIABLES
12200        LDB     PMODE,U            GET PRINT MODE
12300        LEAX    PMTAB,PCR          GET PRINT MODE OFFSET TABLE
12400        LSLB                       MAKE PRINT MODE *2 FOR 16 OFFSET
12500        LDD     B,X                GET PRINT MODE'S 16 BIT OFFSET
12600        LEAX    D,X                MAKE X POINT THE SUBR.
12700        LDA     ,S                 GET CHARACTER TO PRINT
12800        JSR     ,X                 CALL IT
12900        LDB     XCPOS,U            GET PRINT CURSOR X POSITION
13000        ORB     #$E0               MAKE IT BOTTOM LINE
13100        LDA     #5
13200        STD     $88                PUT IT IN BASIC'S CURSOR POSITION
13300        PULS    PC,U,Y,X,D         RESTORE REGS AND EXIT
13400
13500 *SET TEXT CURTSOR Y POSITION
13600 PMODE2 CMPA    WDYLEN,U           IS Y POSITION BIGGER THEN THE
13700        BLO     PMODEA             WINDOW? NO, USE IT!
13800        LDA     WDYLEN,U           ELSE USE THE MAX POSITION
13900        DECA
14000 PMODEA STA     YCPOS,U            STORE IT
14100        CLR     PMODE,U            RESET PMODE TO NORMAL
14200        RTS                        AND EXIT
14300
14400 *GET X POSITION
14500 PMODE1 CMPA    WDXLEN,U           IS THE X POSITION TOO BIG?
14600        BLO     PMODEB             NO, USE IT!
14700        LDA     WDXLEN,U           ELSE USE THE MAX X POSITION
14800        DECA
14900 PMODEB STA     XCPOS,U            STORE IT
15000        INC     PMODE,U            MOVE TO NEXT PRINT MODE
15100        RTS                        AND EXIT
15200
15300 CHRTAB FDB     NUL-CHRTAB         CONTROL COD. VECTORS
15400        FDB     SETPOS-CHRTAB
15500        FDB     SVIDEO-CHRTAB
15600        FDB     IVIDEO-CHRTAB
15700        FDB     SETWIN-CHRTAB
15800        FDB     LEFT-CHRTAB
15900        FDB     RIGHT-CHRTAB
16000        FDB     PING-CHRTAB
16100        FDB     BACKSP-CHRTAB
16200        FDB     TAB-CHRTAB
16300        FDB     LF-CHRTAB
16400        FDB     UPLINE-CHRTAB
16500        FDB     CLS-CHRTAB
16600        FDB     CR-CHRTAB
16700
16800 CHR1   CMPA    #13                IS THE CHARACTER A CONTROL CODE?
16900        BHI     CHR20              SKIP IF NOT
17000        LSLA                       ELSE JUMP TO IT VECTOR
17100        LEAX    CHRTAB,PCR
17200        LDD     A,X
17300        JMP     D,X
17400
17500 CHR20  SUBA    #32                IS IT A PRINTABLE CODE?
17600        CMPA    #96
17700        BHI     CHR29              NO, THEN SKIP TO EXIT
17800
17900        LBSR    HOLDIT             PUT MOUSE CURSOR ON HOLD
18000        LDB     XCPOS,U            GET X-POSITION ON SCREEN
18100        CMPB    WDXLEN,U           PAST RIGHT SIDE?
18200        BLO     CHR21              NO, JUST PRINT IT
18300        CLR     XCPOS,U            ELSE BACK TO LEFT SIDE
18400        INC     YCPOS,U            AND MOVE DOWN LINE
18500        BSR     SCROLL             IF NEEDS TO SCROLL, THEN SCROLL!
18600
18700 CHR21  LEAY    >CHRDAT,PCR        GET CHR DATA TABLE
18800        LDB     #8                 INDEX TO THE CHAR. DATA
18900        MUL
19000        LEAY    D,Y
19100
19200        LDD     WDYPOS,U           GET WINDOW START POSITION
19300        ADDD    YCPOS,U            GET TEXT CURSOR POSITION
19400        ADDA    SSTART             ADD SCREEN START IN MEMORY
19500        TFR     D,X                AND POINT X TO IT
19600        LDB     #8                 NUMBER BYTES PER CHAR.
19700 CHR22  LDA     ,Y+                GET DATA BYTE
19800        EORA    INVERT,U           INVERT IF FLAG IS ON
19900        STA     ,X                 PUT IT ON THE SCREEN
20000        LEAX    32,X               NEXT LINE ON SCREEN
20100        DECB                       ALL BYTES DONE???
20200        BNE     CHR22              LOOP IF NOT
20300
20400        INC     XCPOS,U            NEXT POSITION ON SCREEN
20500 CHR29  RTS
```

Listing 2:

```
00100 *MOUSE5/ASM     PART 2 OF SCREEN DRIVER
00200
00300 *THIS ONE DOES A RETURN ON TEXT SCREEN
00400 CR      LDB     WDXLEN,U        GET LINE LENGTH
00500         SUBB    XCPOS,U         GET BYTE LEFT ON LINE
00600 CR1     DECB                    ANY BYTES LEFT ON LINE?
00700         BMI     CR2             SKIP IF NOT
00800         PSHS    B               SAVE COUNTER
00900         LDA     #32             GET SPACE " "
01000         LBSR    CHR20           PRINT IT ON SCREEN
01100         PULS    B               GET COUNTER
01200         BRA     CR1             LOOP TILL END OF LINE
01300
01400 CR2     CLR     XCPOS,U         PUT TEXT CURSOR AT START OF LINE
01500
01600 *DO A LINE FEED
01700 LF      INC     YCPOS,U         MOVE DOWN ONE LINE
01800 SCROLL  PSHS    A               SAVE PRINTING CHAR.
01900         LDB     YCPOS,U         GET LINE POSITION
02000         CMPB    WDYLEN,U        IS THIS LINE OFF SCREEN?
02100         BLO     SCROLL9         NO, SKIP AND EXIT
02200         DEC     YCPOS,U         ELSE MOVE UP A LINE
02300
02400         BSR     HOLDIT          TURN OFF CURSOR FOR PRINTING
02500         LDA     #15
02600         STA     HOLD,U          MAKE THE HOLD A LITTLE LONGER
02700         LDA     WDYLEN,U        GET NUMBER LINE IN WINDOW
02800         DECA                    DON'T SCROLL THE LAST LINE
02900         BEQ     SCROLL5         SKIP ONLY ONE LINE
03000
03100         LDA     WDYPOS,U        GET TEXT WINDOW LINE POSITION
03200         ADDA    SSTART          ADD THE SCREEN START POSITION
03300         LDB     WDXPOS,U        GET WINDOW C POSITION
03400         TFR     D,X             AND MAKE X POINT TO IT
03500         LDA     WDYLEN,U        GET NUMBER OF LINES IN WINDOW
03600         DECA                    DON'T SCROLL THE LAST ONE
03700         LSLA                    MUL BY 8 SCAN LINES
03800         LSLA
03900         LSLA
04000 SCROLL1 PSHS    X,A             SAVE SCAN LINE COUNT & POINTER
04100         LDB     WDXLEN,U        GET WINDOW X LENGTH
04200         LSRB                    DIVIDE BY 2
04300         BCC     SCROLL2         SKIP IF EVEN
04400         LDA     256,X           MOVE ONE BYTE IF ODD
04500         STA     ,X+
04600 SCROLL2 STB     COUNT,U         SET BYTE COUNTER
04700         BEQ     SCROLL4         SKIP IF ONLY ONE BYTE TO MOVE
04800 SCROLL3 LDD     256,X           ELSE MOVE TWO BYTES AT ONCE
04900         STD     ,X++
05000         DEC     COUNT,U         LOOP TILL ALL BYTES ARE DONE
05100         BNE     SCROLL3
05200 SCROLL4 PULS    X,A             RESET BACK TO START OF LINE
05300         LEAX    32,X            MOVE TO NEXT SCAN LINE
05400         DECA                    ALL LINE MOVED?
05500         BNE     SCROLL1         LOOP IF NOT
05600
05700 SCROLL5 LDB     #8              LINES TO BE BLANKED
05800         LDA     INVERT,U        GET BACKROUND (BLACK OR WHITE)
05900 SCROLL6 PSHS    X,B             SAVE LINE START AND COUNTER
06000         LDB     WDXLEN,U        GET NUMBER OF BYTES PER LINE
06100 SCROLL7 STA     ,X+             PUT DOWN BACKROUND
06200         DECB                    ALL DONE WITH THIS LINE?
06300         BNE     SCROLL7         NO, THEN LOOP
06400         PULS    X,B             GET COUNT & START OF LINE
06500         LEAX    32,X            MOVE TO NEXT LINE
06600         DECB                    ALL LINES DONE
06700         BNE     SCROLL6         LOOP IF NOT
06800         LDA     #2              RESET HOLD
06900         STA     HOLD,U
07000 SCROLL9 PULS    PC,A            AND EXIT
07100
07200 HOLDIT  PSHS    D,Y,U,X         SAVE ALL REGS
07300         LDA     #2              DELAY CURSOR FOR 2 IRQS
07400         STA     HOLD,U
07500         LBSR    CUROFF          TURN OFF CURSOR
07600         PULS    PC,U,Y,X,D      RESTORE AND EXIT
07700
07800 CLS     BSR     HOLDIT          PUT CURSOR ON HOLD
07900         LDA     #10             PIT IT ON HOLD A LITTLE LONGER
08000         STA     HOLD,U
08100         LDD     WDYPOS,U        GET WINDOW POSITION
08200         ADDA    SSTART          ADD START OF SCREEN MEMORY
08300         TFR     D,X             MAKE X THE POINTER TO SCREEN
08400         LDA     INVERT,U        GET BACKROUND COLOR
08500         LDB     WDYLEN,U        GET NUMBER OF LINES
08600         LSLB                    8 LINES PER TEXT LINE
08700         LSLB
08800         LSLB
08900 CLS1    PSHS    B,X             SAVE LINE COUNT & POINTER
09000         LDB     WDXLEN,U        GET NUMBER OF BYTES PER LINE
09100 CLS2    STA     ,X+             PUT BACKROUND ON SCREEN
09200         DECB                    ARE ALL BYTES DONE ON LINE
09300         BNE     CLS2            NO, THEN LOOP BACK
09400         PULS    X,B             GET LINE COUNTER & START OF LINE
09500         LEAX    32,X            MOVE TO NEXT SCAN LINE
09600         DECB                    ALL SCANS DONE?
09700         BNE     CLS1            NO, THEN LOOP
09800         CLR     YCPOS,U         PUT TEXT CURSOR AT
09900         CLR     XCPOS,U         TOP OF WINDOW
10000         LDA     #2              RESET HOLD TO STANDARD
10100         STA     HOLD,U
10200         RTS                     AND EXIT
10300
10400 SVIDEO  CLR     INVERT,U        MAKE WHITE ON BLACK
10500 NUL     RTS
10600
10700 SETPOS  LDA     #1              START GET CURSOR POSITION
10800         STA     PMODE,U
10900         RTS
11000
11100 SETWIN  LDA     #3              START GET WINDOW SIZE & POSITION
11200         STA     PMODE,U
11300         RTS
11400
11500 WMODE1  CMPA    #31             IS WINDOW X START POS <31
11600         BHS     WERROR          IF NOT THAT ERROR
11700         STA     WDXPOS,U
11800         NEGA                    GET MAX WINDOW X LEG FOR THAT
11900         ADDA    #32             START PSOITION
12000         STA     WDXLEN,U        AND USE IT FOR NOW
12100         CLR     YCPOS,U         HOME TEXT CURSOR TO TOP
12200         CLR     XCPOS,U         LEFT OF WINDOW
12300         INC     PMODE,U         MOVE TO NEXT PRINT MODE
12400         RTS
12500
12600 WMODE2  CMPA    #23             IS WINDOW Y START POS <23
12700         BHS     WERROR          IF NOT THEN ERROR
12800         STA     WDYPOS,U
12900         NEGA                    GET MAX WINDOW X LEN FOR THAT
13000         ADDA    #24             STARTING POSITION
13100         STA     WDYLEN,U
13200         INC     PMODE,U         MOVE TO NEXT PRINT MODE
13300         RTS
13400
13500 WERROR  CLR     PMODE,U         RESET PRINT MODE
13600         LBRA    FNERR           AND GIVE A ?FN ERROR
13700
13800 WMODE3  BEQ     WERROR          ERROR IF 0 BYTES PER LINE
13900         CMPA    WDXLEN,U        IS THIS WINDOW TOO BIG?
14000         BHI     WERROR          ?FN ERROR IF SO
14100         STA     WDXLEN,U        ELSE SET LINE LENGTH
14200         INC     PMODE,U         MOVE TO NE XT PRINT MODE
14300         RTS
14400
14500 WMODE4  BEQ     WERROR          ERROR IF LENGTH IS ZERO
14600         CMPA    WDYLEN,U        IS THE SIZE TOO BIG?
14700         BHI     WERROR          FN ERROR IF SO
14800         STA     WDYLEN,U        ELSE SET IT
14900         CLR     PMODE,U         RESET PRINT MODE
15000         RTS                     AND EXIT
15100
15200 IVIDEO  LDA     #255            SET BLACK ON WHITE VIDEO
15300         STA     INVERT,U
15400         RTS
15500
15600 *THIS IS A BACK SPACE CODE ($08)
15700 BACKSP  LDD     YCPOS,U         GET TEXT CURSOR POSITION
15800         DECB                    BACK UP ONE
15900         BPL     BACKS1          USE IT IF STILL ON THE SAME LINE
16000         LDB     WDXLEN,U        ELSE MOVE CURSOR TO END
16100         DECB                    OF LINE
16200         DECA                    AND MOVE UP ONE LINE
16300         BPL     BACKS1          USE IT IF NOT THE TOP OF WINDOW
16400         INCA                    ELSE BACK TOP TOP LINE
16500         CLRB                    AND START OF THE LINE
16600 BACKS1  STD     YCPOS,U         STORE NEW TEXT CURSOR POSITION
16700         LDA     #32             CLEAR (BLANK) THE NEW TEXT
16800         LBSR    CHR20           CURSOR POSITION
16900         DEC     XCPOS,U         MOVE BACK TO THAT PLACE
17000         RTS                     AND EXIT
17100
17200 LEFT    LDA     XCPOS,U         GET TEXT CURSOR'S X POSITION
17300         DECA                    MOVE BACK ONE
17400         BPL     LEFT1           IF STILL ONE LINE? THEN USE IT
17500         LDA     WDXLEN,U        ELSE MAKE IT THE MAX RIGHT
17600         DECA                    POSITION ON LINE
17700 LEFT1   STA     XCPOS,U         AND STORE IT
17800         RTS                     ALL DONE AND EXIT
17900
18000 RIGHT   LDA     XCPOS,U         GET TEXT CURSOR'S X POSITION
18100         INCA                    MOVE TO RIGHT
18200         CMPA    WDXLEN,U        GONE TOO FAR?
18300         BLO     RIGHT1          NO, THEN USE IT (SKIP)
18400         CLRA                    ELSE MOVE TO FAR LEFT
18500 RIGHT1  STA     XCPOS,U         AND STORE IT
18600         RTS                     ALL DOWN, EXIT
18700
18800 UPLINE  DEC     YCPOS,U         MOVE TEXT CURSOR UP ONE LINE
18900         BPL     UPLIN1          MOVE OFF OF TOP OF WINDOW?, NO SKIP
19000         LDA     WDYLEN,U        SET TO BOTTOM OF WINDOW
19100         DECA
19200         STA     YCPOS,U
19300 UPLIN1  RTS
19400
19500 TAB     LDB     XCPOS,U         GET TEXT CURSOR POSITION
19600         ANDB    #7              GET OFFSET FROM TAB STOP (EVERY 8)
19700         NEGB                    GET NUMBER TO NEXT NEXT ONE
19800         ADDB    #8
19900         LDA     #32             GET A SPACE " "
20000 TAB1    PSHS    D               SAVE BOTH
20100         LBSR    CHR20           PRINT THAT SPACE
20200         PULS    D               GET BOTH
20300         DECB                    AT NEXT TAP STOP?
20400         BNE     TAB1            NO, THEN LOOP
20500         RTS
```

Listing 3:

```
00100 * CHARACTER SHAPE DATA
00200 * EACH ONE IS 8 BYTES LONG (A 8 BY 8 DOT SIZE)
00300 * THERE ARE 96 CHARACTERS
00400 * THE ASSEMBLER THAT I USE ALLOWS FOR MORE THEN ONE EXPRESSION PER LINE
00500 * IF YOU ARE USING THE RADIO SHACK ASSEMBLER YOU MAY HAVE TO
00600 * PUT EACH EXPRESSION ON IT'S FDB LINE
00700
00800 CHRDAT  FDB     0,0,0,0                 ' '
00900         FDB     2056,2056,2048,2048     !
01000         FDB     2570,2560,0,0           "
01100         FDB     2570,7946,7946,2560     #
01200         FDB     2078,10268,2620,2048    $
01300         FDB     12850,1032,4134,9728    %
01400         FDB     4136,10256,10788,6656   &
01500         FDB     2056,4096,0,0           '
01600         FDB     1032,4112,4104,1024     (
01700         FDB     2052,514,516,2048       )
01800         FDB     2090,7230,7210,2048     *
01900         FDB     8,2110,2056,0           +
02000         FDB     0,0,2056,4096           ,
02100         FDB     0,62,0,0                -
02200         FDB     0,0,8,2048              .
02300         FDB     514,1032,4128,8192      /
02400         FDB     7202,9770,12834,7168    0
02500         FDB     2072,2056,2056,7168     1
02600         FDB     7202,524,4128,15872     2
02700         FDB     7202,524,546,7168       3
02800         FDB     1036,5182,1028,1024     4
02900         FDB     15904,8252,514,15360    5
03000         FDB     7202,8252,8738,7168     6
03100         FDB     15906,1028,2056,2048    7
03200         FDB     7202,8732,8738,7168     8
03300         FDB     7202,8734,546,7168      9
03400         FDB     8,0,2048,0              :
03500         FDB     8,2048,2056,4096        ;
03600         FDB     1032,4128,4104,1024     <
03700         FDB     0,15872,15872,0         =
03800         FDB     4104,1026,1032,4096     >
03900         FDB     7202,516,2048,2048      ?
04000         FDB     7202,538,10794,7168     @
04100         FDB     7202,8766,8738,8704     A
04200         FDB     15394,8764,8738,15360   B
04300         FDB     7202,8224,8226,7168     C
04400         FDB     14372,8738,8740,14336   D
04500         FDB     15904,8252,8224,15872   E
04600         FDB     15904,8252,8224,8192    F
04700         FDB     7202,8238,8738,7168     G
04800         FDB     8738,8766,8738,8704     H
04900         FDB     15880,2056,2056,15872   I
05000         FDB     3842,514,530,3072       J
05100         FDB     8740,10288,10276,8704   K
05200         FDB     8224,8224,8224,15360    L
05300         FDB     8758,10794,8738,8704    M
05400         FDB     8754,12842,9766,8704    N
05500         FDB     7202,8738,8738,7168     O
05600         FDB     15394,8764,8224,8192    P
05700         FDB     7202,8738,10788,6656    Q
05800         FDB     15394,8764,10276,8704   R
05900         FDB     7202,8220,546,7168      S
06000         FDB     15880,2056,2056,2048    T
06100         FDB     8738,8738,8738,7168     U
06200         FDB     8738,8738,5140,2048     V
06300         FDB     8738,8746,10806,8704    W
06400         FDB     8738,5128,5154,8704     X
06500         FDB     8738,5128,2056,2048     Y
06600         FDB     15874,1032,4128,15872   Z
06700         FDB     14368,8224,8224,14336   [
06800         FDB     8224,4104,1026,512      BACK "/"
06900         FDB     3586,514,514,3584       ]
07000         FDB     2076,15880,2056,2048    ^
07100         FDB     8,6206,6152,0           LEFT ARROW
07200         FDB     0,0,0,0                 BLANK (ADD YOUR OWN)
07300         FDB     0,3074,3602,3328        a
07400         FDB     8224,15394,8738,15360   b
07500         FDB     0,7202,8226,7168        c
07600         FDB     514,7714,8738,7680      d
07700         FDB     0,7202,15904,7168       e
07800         FDB     1034,2076,2056,2048     f
07900         FDB     0,7202,9754,540         g
08000         FDB     8224,11314,8738,8704    h
08100         FDB     2048,6152,2056,7168     i
08200         FDB     24,2056,2056,10256      j
08300         FDB     8224,9256,12328,9216    k
08400         FDB     6152,2056,2056,7168     l
08500         FDB     0,30281,18761,18688     m
08600         FDB     0,11314,8738,8704       n
08700         FDB     0,7202,8738,7168        o
08800         FDB     0,11314,12844,8224      p
08900         FDB     0,6694,9754,514         q
09000         FDB     0,11314,8224,8192       r
09100         FDB     0,7200,7170,7168        s
09200         FDB     2056,7176,2058,1024     t
09300         FDB     0,8738,8742,6656        u
09400         FDB     0,8738,8724,2048        v
09500         FDB     0,16705,18761,13824     w
09600         FDB     0,8724,2068,8704        x
09700         FDB     0,8738,7682,540         y
09800         FDB     0,15876,2064,15872      z
09900         FDB     1032,4104,4104,1024     (
10000         FDB     2056,2048,2056,2048     :
10100         FDB     2052,516,516,2048       )
10200         FDB     0,8272,2564,0           WAVE
10300         FDB     65535,65535,65535,65535 DELETE (ALL ON)
10400
```

One-Liner Contest Winner . . .

Enter your text and the computer tells you what vowels you have used and how many times.

The listing:

```
10 CLEAR 400
20 LINEINPUT"TEXT: ";A$:FORC=1TO
LEN(A$)+1:X$=MID$(A$,C,1):IFC=LE
N(A$)+1THENPRINT" A  E  I  O  U"
:PRINTA;E;I;O;U:ELSEIFX$="A"THEN
A=A+1:NEXTELSEIFX$="E"THENE=E+1:
NEXTELSEIFX$="I"THENI=I+1:NEXTEL
SEIFX$="O"THENO=O+1:NEXTELSEIFX$
="U"THENU=U+1:NEXTELSENEXT
```

Frank Marino
Kissimmee, FL

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape*.)

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SAVINGS/LOANS - Personal finance calculations.
DIRECTORY - Keep track of phone numbers, addresses, etc. Print address labels.
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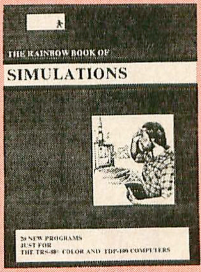
Send check or money order - no cash. Pa. residents add 6%.

Tothian Software, Inc.
Box 663
Rimersburg, Pa. 16248

Recommended Reading for Your CoCo from . . .

The Rainbow Bookshelf

THE COMPLETE RAINBOW GUIDE TO
OS-9
By Dale L. Puckett and Peter Dibble


THE RAINBOW BOOK OF
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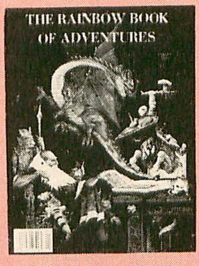

THE SECOND RAINBOW BOOK OF
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The Complete Rainbow Guide To OS-9

The book that demystifies the state-of-the-art operating system for the Tandy Color Computer. Authors Dale L. Puckett and Peter Dibble show you how to take advantage of OS-9's multi-tasking and multi-user features, and the capability of redirecting input and output commands at will. An easy-to-read, step-by-step guide packed with hints and tips, tutorials and free software in the form of program listings.
Book $19.95, Disk $31.00 (2 disks, book not included)

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Please note: The tapes and disks offered by The Rainbow Bookshelf are not stand-alone products. That is, they are intended to be an adjunct and complement to the books. Even if you buy the tape or disk, you will still need the appropriate book.
OS-9® is a registered trademark of the Microware Systems Corporation.

To order by phone (*credit card orders only*) call 800-847-0309, 8 a.m. to 5 p.m. EST. For other inquiries call 502-228-4492.

DOWNLOADS

Telepatch to the Rescue

By Dan Downard
Rainbow Technical Editor

• *I am using an old copy of* Telewriter-64, *disk version, for my word processing. When I purchased a new disk controller for my disk drive (Disk BASIC 1.1), I found that* Telewriter *no longer goes to the disk I/O menu. I get an FC Error. When I switched my new controller for an old controller (Disk BASIC 1.0), the* Telewriter *worked fine. So the problem is definitely the controller.*

Do you have any information on a fix for this problem?

Jeffrey Mofenson
Mineola, NY

Jeffrey, *Telewriter-64* is different for Disk BASIC 1.0 and 1.1. Since the machine language routines have been moved in the 1.1 ROM, a different version of *Telewriter* was necessary. There's nothing wrong with your controller.

There are two solutions to your problem. The first is to find an updated version of *Telewriter*, one for your 1.1 ROM. The second solution is to buy *Telepatch*, an enhancement program that adds several improvements to *Telewriter-64*. *Telepatch* also allows you to use either 1.0 or 1.1 Disk BASIC. *Telewriter* was one of the first and, in my opinion, best programs written for the CoCo.

Dan Downard is an electrical engineer and has been involved in electronics for 27 years through Ham radio (K4KWT). His interest in computers began about eight years ago and he has built several 68XX systems.

What's OS-9 For, Anyway?

• *I own a 64K CoCo 2, single drive and a DMP-105 printer. I purchased OS-9 about four months ago hoping that it would allow me to use and teach me to write assembly language programs. So far I can find no use whatsoever for my OS-9 system aside from buying software for it or buying something like BASIC09. If anyone knows of a good book to teach a newcomer how to program in assembly language, or if anyone has done something with OS-9 either with or without the assembler, let me know what it was you did and how you did it. I can be reached at 2026 Lardner St., 19149.*

Michael Keefe
Philadelphia, PA

OS-9 is just an operating system, Michael, not a language, per se. If you want to learn assembly language programming, I suggest obtaining *Assembly Language Programming for the TRS-80 Color Computer*, by William Barden, Jr. This book is sold in all Radio Shack Computer Centers. It explains assembly language programming, but has nothing to do with OS-9.

After you understand the principles of this book, I suggest moving up to OS-9. An adequate portion of *The Complete Rainbow Guide to OS-9* by Dale Puckett and Peter Dibble is devoted to OS-9. People used to assembly language programming find OS-9 tedious at first, but learn to appreciate its flexibility.

My last bit of advice comes from experience. Don't even bother with assembly language programming unless you have a good reason. That's what higher level languages such as BASIC were written for — to eliminate the need for assembly language programming.

Serial Conversion

• *In the May 1986 "Downloads" you revealed the secret to interfacing DB-25 RS-232 printers to the CoCo. Is there a similar method to wire into the Centronics Parallel Port Printers?*

I know that commercial serial to parallel interfaces are available, but I'd rather go direct, if possible. Would it be simpler to install a Centronics Port in the CoCo?

R. Stanwood
Langley, British Columbia

The DB-25 is the standard for RS-232, or serial interfaces. The key to your question is serial vs. parallel. Serial data communications sends data one bit at a time. Parallel data is sent one byte, or eight bits, at a time. A strobe pulse is used to sync the parallel transmission. Therefore, you must first convert the serial data to a parallel format before sending it to a Centronics compatible port.

Hazardous TVI Solution

• *This is in reference to your reply to Mr. Biggs' TV interference problem in the February 1986 "Downloads."*

Mr. Biggs was told that one method of eliminating or reducing his TVI problem consisted of spraying a metallic coating on the inside surface of his CoCo's case. This is an excellent way of controlling a TVI problem. It should be noted, however, that there are possible hazards associated with a metallic aerosol coating. If the coating is not designed to adhere to the surface it is being applied to, or is not applied per the written instructions, the coating may peel off and come in contact with uninsulated conductors. If the coating falls across low voltage logic circuits there is a possibility of data errors or IC chip damage. If the coating falls across high voltage power circuits, an increased shock or fire hazard is presented.

There are several possible alternatives to using a metallic coating. You may try simply moving the computer a foot or two in any direction, or try plugging the computer into a power receptacle of a different circuit. If these methods fail, a metallic coating might be a good solution, but please use caution!

Kurt Stefans
Roselle, IL

Kurt, first of all, I am not aware of any high voltages present inside a CoCo. Any type of modification to electronic devices requires a certain amount of care in dealing with conductive materials. Some of the worst disasters I have seen inside CoCos have been caused by improper soldering techniques. I have never seen one catch on fire, but who knows?

I agree that you should not modify any electrical device without using proper care and craftsmanship. At the same time, I don't see too many unmodified CoCos around anymore.

OS-9 Copy Malfunction

• *I recently purchased the OS-9 system and was quite frustrated to find I could only make one copy of the master disk, and even then only after many attempts. I assume the original disk is all right since one copy was made and there is nothing wrong with the drive (the speed was checked) and all my other disks work fine, including the one copy of the OS-9 disk (except for the copy routine). I've tried everything I can think of and have come to the end of my rope. I wrote to Tandy but they were only able to suggest a speed check. I was wondering if you had heard of this problem before. Any information would be helpful. I have a CoCo ('E' board) with 64K, a single disk drive with DOS 1.1 and an SG-10 printer.*

Andrew Richardson
Orleans, Ontario

The original release of CoCo OS-9 had a speed check program on the Boot disk, Andrew. As you have checked the speed of both drives, I assume this is not the problem.

Try backing up the backup copy. It is the same as the original for OS-9 Version 01.00.00. Maybe you inadvertently wrote something onto the master disk. There is no reason you shouldn't be able to back up the master.

Version 02.00.00 is a different situation. A configuration disk is included in the package to allow for different drivers. Even in this case, once you have made a system disk, you should be able to use the Backup command to make a duplicate.

Ham-ware Discovered

• *In answer to your request for commercial software for Ham radio, I suggest Spec-Com for* RTTY, Sloscan, CW *and many other software programs on disk and cassette. A catalog of CoCo software may be obtained by sending an SASE to: Spec-Com, P.O. Box H, Lowden, IA 52255.*

Bob Garber
El Paso, TX

I have received numerous letters requesting Ham software, Bob. I have not seen any of the programs you mention, but thanks for the help.

Secret Software

• *Is there a way to hide programs on disk so they are unable to be seen with* DIR*? How would one undo this function? How many ways are there to do this sort of thing?*

Marc Mundt
Louisville, KY

Marc, the easiest way I know of to protect programs from being loaded is to make one of the characters a control code. It will not appear in the directory, but loading the program is a little tedious.

There are several other ways to load programs using direct calls to the Disk ROM. A commercial one is available to do this. Look through the ads in this issue.

EDTASM+ Answer Correction

• *In June 1986 you told Dean Pace he could set Super-Patched* EDTASM+ *to the 32K mode and disassemble Disk* BASIC *by changing memory location $FFDE. This won't work.* SPEDTASM *is patched so that it displays 64K RAM, but flips back to ROM for operations such as reading a key or printing a character. If he uses ZBUG to change $FFDE,* SPEDTASM *flips the ROM-RAM switch at least twice before he even sees the result displayed onscreen. What Mr. Pace needs to do is assemble a short program into memory and copy ROM to upper RAM.*

Because SPEDTASM *operates from ROM, Mr. Pace can single-step through the RAM image, change it and experiment to his heart's content.*

This program ought to do the trick for him:

```
START   ORCC    #$50
        LDS     #$E000
        LEAU    ,S
LOOP    STA     $FFDE
        LDY     ,--S
        LDX     ,--S
        LDD     ,--S
        STA     $FFDF
        PSHU    Y,X,D
        CMPU    #$8000
        BHI     LOOP
        ANDCC   #$AF
        SWI
        END     START
```

Fred Sawtelle
Huntsville, TX

Thanks for the info, Fred. Your program also gives all our readers a lesson in assembly language programming.

Your technical questions are welcomed. Please address them to: Downloads, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We reserve the right to publish only questions of general interest and to edit for space and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

Your technical questions may also be sent to us through the MAIL section of our new Delphi CoCo SIG. From the CoCo SIG> prompt, pick DELPHI MAIL, then type SEND **and address TO: DANDOWNARD. Be sure to include your complete name and address.**

RAINBOWTECH

ACCESSIBLE APPLICATIONS

Reviewing PenPal Applications

By Richard A. White
Rainbow Contributing Editor

Last month we began a discussion of the *PenPal* integrated software package from Four Star Software in Canada. This month we will discuss additional modules, starting with Calc.

Calc alone is a good, if not great, spreadsheet. It lacks an `IF . . . THEN . . . ELSE` statement and lookup tables, so you won't want to try to write an income tax spreadsheet with it. But it has a few neat features that make up for these omissions. If you want to plot data directly from spreadsheet files, the Graphit module is excellent. To make graphs, bar charts or pie charts, the Calc/Graphit combination may be the best available for the CoCo today.

As with all *PenPal* applications, Calc is function-key driven with a function-key strip displayed on the bottom two lines of the 51 character by 24 line screen. There are enough functions to require a primary and a secondary key strip. These are toggled by pressing CLEAR and '0'.

Spreadsheet size is 255 columns by 255 rows. Of course, you cannot use all of the cells at one time due to memory limitations. Still, you can use quite a few, since Calc is conservative in its use of memory. It seems to be quite competitive with *DynaCalc* in this regard. You start with 26,458 bytes of buffer space, so very sizable spreadsheets are possible.

Calc saves memory in other ways. Numbers are saved with nine place accuracy using only five bytes per entry. This is sufficient accuracy for most applications. If you need more, *DynaCalc* works to 16 digit accuracy, but needs a few more bytes to store each number.

When a cell is used, some memory is allocated for the cells in the block between cell A1 and the newly used cell. This is true of most spreadsheets. If you delete some of the columns or rows in that block, you don't immediately get back all the memory involved. However, if you save and then reload the sheet, cell pointers are reset for best memory economy.

Initially, label entry appears to be the same as many other spreadsheets. You can enter a long label, but only those characters that fit the column width are displayed. If you move the cursor to the cell, more of the text is displayed in the cell descriptor line (line two) at the top of the screen. During label entry, you can use the '@' key to backspace over the label to make corrections. Once the label is entered, there is no way to edit it. The same is true for numbers and formulas. This is Calc's greatest weakness, which is partially compensated for by the ability to define a text block.

A text block is new to me. An area of the screen is selected (it could be the whole screen, but not exceed screen boundaries) and defined as a text block using a function key. The cursor appears in the upper left-hand corner of the block. You now have a small text editor with which you can enter text in the block. Use the arrow keys to move over the text to do editing. Word wrap is not supported; you must do this manually. Exit a text block with the BREAK key.

Once defined, the text block remains available. When you place the cursor within the block and press the function key, you go back into the text editing mode. When not in the editing mode, labels, numbers and formulas can be put into text block cells in the normal manner. Those cells are removed from the block and work as normal spread-

---

Richard White lives in Fairfield, Ohio, and has a long background with microcomputers and specializes in BASIC programming. With Don Dollberg, he is the co-author of the TIMS *database management program.*

sheet cells. This breaks the text block into pieces above and below, or right and left of the normal cells.

If you set up a text block, write text into it and then change the widths of columns passing through the block, the text display is broken up. Not to worry. Simply put the cursor inside the block and use the text function key, and the text is reformatted. If the size of the block is reduced so there is more text than space, the text is truncated. Further, without word wrap, words are broken at the right margin and you have to do some editing by hand. But it's better than typing it in from the beginning. Blocks can be defined for other purposes, including deleting, copying, printing and saving a portion of a spreadsheet either as a spreadsheet file or ASCII file.

The block copy function works much like copy in *Lotus 1-2-3* except you select the block first and then press the function key to define the block to be copied. Move the cursor to the upper left-hand cell you want to copy to and press the copy function key again. This leads us to absolute or relative addressing. Here is a simple example. This formula is in screen location F1: D1 + E1 + #E5. When I copy it to screen location F2 it becomes D2 + E2 + #E5.

Cell references D1 and E1 are treated like they refer to the second cell to the left and the first cell to the left, and are adjusted to maintain this same relation when the formula is copied to F2. E5 is preceded by a '#' which tells Calc not to adjust this cell reference. It is called an absolute address, which always is to reference the same cell irrespective of where the formula is copied.

Calc contains a typical selection of trigonometric and other functions and operands. Like *DynaCalc*, formulas are evaluated from left to right with no hierarchy of operands except the portions in parentheses which are evaluated innermost first. As I have cautioned before, this can lead to incorrect results if you do not assure that a multiplication or division is performed before the result is added or subtracted. Without hierarchy of operators this can happen unless you use parentheses to force the order of calculation.

Calc has a very limited number of built-in formulas, including AVG (average), MAX (maximum value in defined range), MIN (minimum value) and SUM (summation of all cells in the range). For each of these the range can be a block of cells. Whenever a spreadsheet offers built-in formulas like these, we need to know how each formula deals with empty cells and cells including text or labels. These functions assume that empty and label or text cells contain zeros. AVG(A1-A10) assumes that all 10 cells in the range contain numbers even if one or more don't. In such a case an incorrect average would be returned. MIN(A1-A10) gets confused in the same way and returns a zero if there is an empty or label-containing cell. MAX and SUM are not affected and always return a correct result.

Perhaps even more basic is the fact that Calc performs a calculation even when there are empty or label cells in the range. Some spreadsheets return an error, forcing the user to put zeros in empty cells and get rid of labels within the range. This means more work and untidy results.

Those whose first spreadsheet was *Spectaculator* will remember CMT and RMT for cumulative sum of a column or row. That was all we had four years ago, but why include these formulas when the more able and understandable SUM is included? If you use Calc, forget CMT and RMT.

Finally, a cell can be set up to receive a constant at the time of calculation. With this, you could set up a form and prompt the user to make entries one by one, assuring all required numbers are entered. You could type in letters or a word, but this shows up as a zero. It would be nice if words could be entered and placed in cells in a prompted mode. Then all sorts of forms could be put together in a spreadsheet, and be filled out following prompts on the entry line. Please, Four Star, add this to the Version 3 wish list.

To set up a cell for prompted entry, put the cursor on the cell, press the formula function key and then type ? and the text to be in the prompt. All formulas are entered by positioning the cursor and using the formula function key to get into formula entry mode.

I mentioned you can save a portion of a spreadsheet to a file. You can also merge that save or any spreadsheet into another. The merge starts at the current cursor location when merge is called and proceeds right and down. One obvious use is to move data from one spreadsheet to another. Another is to combine a number of smaller spreadsheets into one big one.

There are a couple of unusual defaults. If you try to print or make an ASCII save without previously selecting a range to save or print, the screen is selected as the default range. All in all,

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Calc is a nice piece of work and adds major value to the *PenPal* package.

We come now to Graphit that works with a Calc file to produce plots of data selected from the file. Similar capabilities are included in the Disk BASIC Version of *DynaCalc*, but not in the OS-9 version. Graphit makes line, dot or bar graphs in either horizontal or vertical directions. It also makes pie charts, and the segments can be filled with textures selected from nearly 100 available choices.

Graphit has powerful graph-labeling capabilities, including a selection of font sizes ranging from 32 to 64 columns. You also have control of the display style. For example, you might want to use light letters over a dark texture or surround dark letters with a light box over a dark background.

Graphs may be saved to a /GP file to be later loaded back into Graphit, or as a binary file that can be loaded into some other graphics program, or to a BASIC program for display or modification using BASIC's graphics commands. Finally, you can print graphs either single or double size. A number of the most popular printer protocols are supported. The pie chart prints oval on my LP VIII in double size, but is close to round in normal size. It also appears oval on the screen.

Graphit works from function-key strips displayed only when the CLEAR key is pressed. It's easy to do the basics and to redraw the graph in different ways to choose the one with most clarity or impact. Lettering the graph is easy, as is choosing and using textures for the pie chart.

Graphit has only an 8,500-byte buffer for the spreadsheet file it is to plot. Calc can deal with spreadsheets three times that size. When working with a larger spreadsheet you need to save the parts of the sheet with the data to be plotted to separate small files. Now we can better appreciate Calc's ability to make such small files.

Telecom is a full-featured telecommunication program that uses the RS-232 port on the CoCo. For me, this is unfortunate since my port is not working. It is also confusing, since the printer that works off the same plug works fine from the CoCo. Who said computers were rational? At least my diagnostics ROM agrees the port is bad.

I have the Radio Shack RS-232 ROM Pak, which both *Mikeyterm* and *DeskMate* use, so I have all the telecommunications capability I need. Still I would like to have used Telecom rather than just reporting on the documentation.

Things can get foggy in a hurry in telecommunications. This is partly due to the variety of settings and options available. Delphi, CompuServe and most microcomputer-based bulletin boards are fairly standard and work at the default settings supplied with Telecom, *DeskMate* and other packages. Telecom has all the tools needed to deal with nonstandard beasts if you need to use them.

You do not need a modem to use Telecom. You can connect directly with another computer in the same room or nearby. You will need a special three-wire cable called a null modem. One is easily made from components stocked by all Radio Shack Stores. You will need the right plug to go into the RS-232 plug on each computer. The CoCo uses an oddball four-pin DIN plug. The best way to get one is to buy a CoCo printer/modem cable, 26-3020 for $4.95. If connecting two CoCos, swap the wires to pins 2 and 4 on one plug. Plug the cable into the two machines, load the terminal programs and go.

If you are connecting to a different computer, it will most likely need a standard, 25-pin RS-232 male plug. I would still start with the CoCo cable and replace one four-pin DIN with the RS-232 plug. Pins 1, 2, 3 and 4 on the CoCo plug go to pins 8, 2, 7 and 3 on the RS-232.

If you plan to work over the telephone, you need a modem and a modem cable. The modem cable mentioned works only with Radio Shack modems. Other modems usually require a male RS-232 plug on the cable. You can make a cable just like the null modem cable above, except the wires to pins 2 and 3 on the RS-232 plug are swapped.

Starting at the top we come to Baud rate. Some years ago, 300 Baud was fairly standard. All communications services support this rate. If you are connecting directly to another computer, you can use the highest rate commonly supported by the two computers. Telecom will run at 2400 Baud provided the screen display is turned off. Otherwise, 600 Baud is recommended to avoid losing data. Of course, I want to work the bulletin board at 1200 Baud and I could not do that very well with my screen display off. Maybe I'll find a way if I get my serial port fixed.

Telecom defaults to 300 Baud. All the other defaults look good except duplex. The default is not to echo typed characters to the screen. Most bulletin boards send back each character as they receive it and Telecom dutifully displays that character so you know what you typed. This is called full duplex. If you hook up to another computer using a package like Telecom, it most likely will not echo characters as it receives them. This also goes for time-sharing services running on IBM mainframes. So now you must turn half duplex on in Telecom to see what you are typing.

Telecom supports a powerful autolog file capability. You are able to change any communications parameters from an autolog file. Say you had been having a session on a local bulletin board and want to call up your company's office mail system running on an IBM mainframe.

First, you empty the buffer and enter the IBM autolog file. Execute this file by pressing the function key. The first thing it might do is change from full to half duplex. Next, if you have an auto-dial modem, it could send the modem instruction to dial including the number to dial. Once connection is made, the office machine manages the user's logon by asking for certain responses. The autolog file can contain instructions to look for prompts and to send specified character strings at each prompt which completely automates the logon. This can be particularly useful on a bulletin board with nested menus. You could be automatically logged on and have the mail reading started.

When I upload or download, I nearly always use the CPM or Xmodem protocol. Those are two names for the same thing. Basically, 128-byte buffers and a check digit are sent at one time. The receiving software recalculates the check digit and compares it to the one it received. If they check, successful transmission is acknowledged and the next buffer is sent. A mismatch means there was a transmission error and the sending computer is caused to resend the buffer. Telecom supports the Xmodem protocol.

In summary, *PenPal*'s Calc is a step or two below *DynaCalc* in functions, is comparable in memory efficiency and has a superior graphing capability in Graphit. In some ways, Telecom is a bit better than the public domain *Mikeyterm* and does everything most other terminal packages do. Couple this with the competent word processor discussed last month and the file module yet to be discussed, and at $89.95, you have one of the best software values on any computer today.

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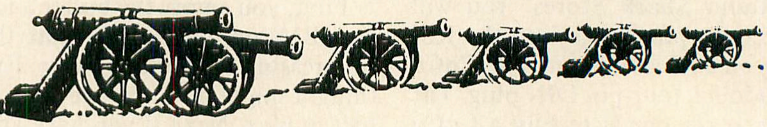

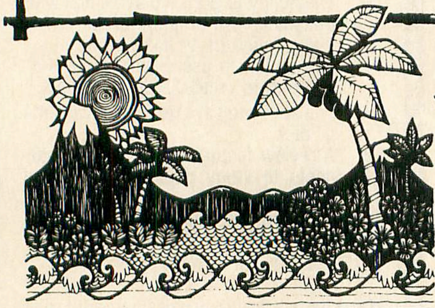

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BARDEN'S BUFFER

The Adventure of the Too Many Printers

By William Barden, Jr.
Rainbow Contributing Editor

"My dear fellow," said Sherlock Holmes, as we sat on either side of the fire in his lodgings on Baker Street. "I really wish you would consider buying a Color Computer 2 in place of that older model. I know that you are exceedingly unhappy with your present machine."

I turned to look in amazement at the tall spare figure seated in the armchair next to the Tandy 3000. A glimmer of of interest was present in his eyes.

"How could you possibly know that, Holmes?"

"Elementary, my dear Watson. I know from observing you at the computer that you are a two-fingered typist, using the index fingers of both hands. The tips of those fingers and those fingers alone have calluses, which you've been peering at intently all evening with some dismay, I might add. I also observe that you've replenished your supply of diskettes with those in Radio Shack envelopes, indicating a visit to the local Radio Shack Computer Center, as our seventeen local stores never carry more than three each, or three of any product, for that matter. The Radio Shack computer catalog is also lying open to the page displaying Color Computer products. All of these minutiae point to the fact that you're seriously considering the new model. Furthermore, I saw the sales slip."

I could not help laughing at the ease with which he explained his process of deduction. "It is, indeed, obvious, Holmes."

"Quiet, Watson," my friend suddenly whispered. "Unless I miss my guess that will be our friend I observed a moment ago coming up the stairs. We are about to be visited by a stout fellow approximately six feet tall, weighing 280 pounds and wearing a T-shirt upon which is emblazoned 'I Love My CoCo.'"

A knock sounded on the door.

"Come in," Holmes replied.

The door opened and a stout fellow approximately six feet tall and about 280 pounds entered. He was wearing a T-shirt upon which was printed "I Love My Tandy 1000."

"Is this PCM Magazine?" he queried.

"I'm sorry, you have the wrong story," Holmes replied, with some brusqueness.

The caller made a quick egress. Another knock sounded at the door.

Holmes shouted out, "Come in!" The door opened and a stout fellow approximately six feet tall and about 280 pounds entered. He was wearing a T-shirt upon which was emblazoned "I Love My Color Computer 2."

"Close enough," Holmes muttered.

"Are you Sherlock Holmes, the famous detective?" the caller asked anxiously, his eyes downcast as if he were in deep despair.

"Yes, Mr. Purcell-Smith," Holmes replied.

"But how did you know my name, Mr. Holmes?"

"I'm afraid, Mr. Purcell-Smith, that you've achieved some notoriety since your recent marriage to Joan Purcell, the chief programmer of Slothware. How may I help you?"

I winced as I heard Holmes use that pat phrase gleaned from too many visits to his local Radio Shack.

"Mr. Holmes, you must help me!" Purcell-Smith blurted. "One of our programmers has been found dead and my wife has been arrested by Lestrade of the Fort Worth Yard!"

"Calm down, man!" said Holmes, sternly. "Tell us your story from the beginning."

"Well, Mr. Holmes, my wife has been working for some time now on a new

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Bill Barden has written 27 books and over 100 magazine articles on various computer topics. His 20 years experience in the industry covers a wide background: programming, systems analyzing and managing projects ranging from mainframes to microcomputers.

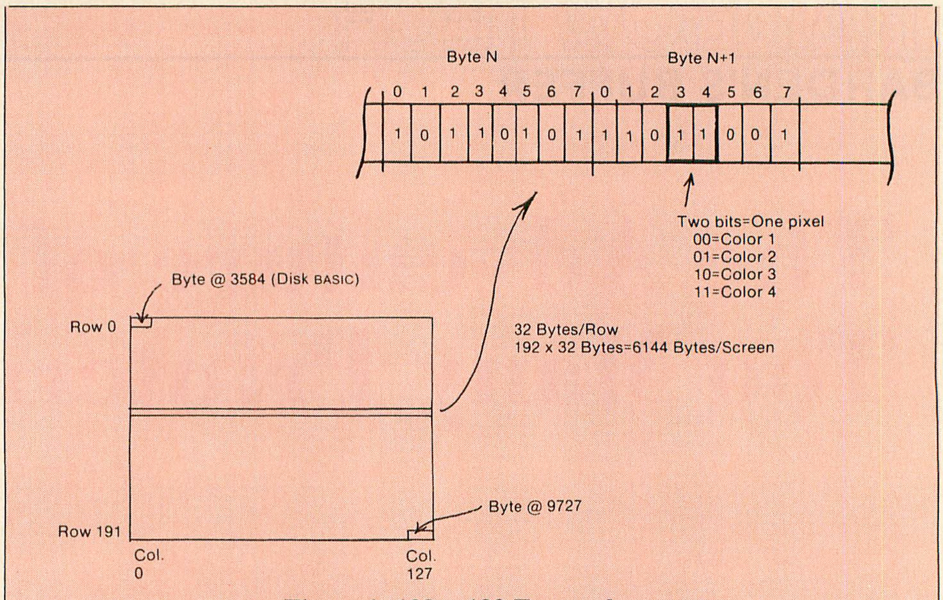
Byte N
Byte N+1
0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7
1 0 1 1 0 1 0 1 1 1 0 1 1 0 0 1
Two bits=One pixel
00=Color 1
01=Color 2
10=Color 3
11=Color 4
Byte @ 3584 (Disk BASIC)
Row 0
32 Bytes/Row
192 x 32 Bytes=6144 Bytes/Screen
Byte @ 9727
Row 191
Col.
0
Col.
127

Figure 1: 128 x 192 Four-color Graphics Mode

project for Slothware. It's a screen dump program for the Color Computer. Never having written such a program before, she ran into several major obstacles.

"First of all, she had to figure out how points on the screen were held in memory and where that memory was located."

"That doesn't appear to be a great problem," said Holmes. "As I recall, the Color Computer holds its graphics screens starting at location 1536 decimal for nondisk systems and starting at location 3584 decimal for disk systems. Each screen is 6,144 bytes long for graphics modes 3 and 4. For graphics mode 3, 128 by 192, there are 24,576 elements of two bits each. For graphics mode 4, there are 49,152 elements of one bit each."

As Holmes spoke, he rapidly sketched two drawings, one representing the 128 by 192 two-color graphics mode 3 and the second representing the 256 by 192 two-color graphics mode 4 (see figures 1 and 2).

"I wrote a monograph on the subject after my episode involving the Giant Computer of Sumatra. But please continue, Mr. Purcell-Smith."

"The next problem my wife ran into was computer graphics. It seems that most Radio Shack printers use the same scheme for graphics, one involving seven bits per character position." Our visitor paused and shot a baffled glance at Holmes.

"Ah, yes. The singular seven-bit problem. An interesting exercise. It appears that early in the printer game someone at Radio Shack decided to design a graphics printer. Most printers at the time used a five by seven dot matrix for each character. Each ASCII, or text, character was converted by the printer electronics into a series of five vertical columns, each column consisting of seven possible dots." He sketched another rapid illustration on the bottom of a Persian slipper (see Figure 3).

"What could have been more natural than implementing graphics in the existing printers than to make each one of those seven print wires or print positions programmable in graphics mode. All that was required was a command to 'set graphics mode' in the printer. After graphics mode was set, the printer decoded each character that came to it as a coded form of which of those seven wires to print. The only requirement for each graphics character was it could not be in the normal range of ASCII characters from zero through 127. It must be in the range of 128 through 255."

"Yes, Mr. Holmes, I understood that part of it, but could not see how the encoding took place."

"Imagine that the topmost dot of each column was represented by a one, the next by a two, the next by a four, the next by an eight, the next by a 16, the next by a 32, and the last by a 64. Once graphics mode is set, you simply have to add the dot values for the column plus 128 to mark graphics mode. Let me illustrate."

Holmes took out a pistol and aimed it at a spot on the wall next to the letters "M. T." created by bullet holes. (Victoria Regina had yielded to Maggie Thatcher years ago.)

"Suppose you wanted to print the upper three dots and the bottommost dot in a graphics column." He fired the gun four times to denote the column. "The code for the graphics column would be one plus two plus four plus 64 for the bottommost column plus 128 to mark the character as graphics. That would be a total of 191."

"But how would that 191 value be sent to the printer, Mr. Holmes? You can send text by doing a `PRINT#-2` of a string, but how can a nonprintable character be sent?"

"By using the `CHR$( )` function, Mr.

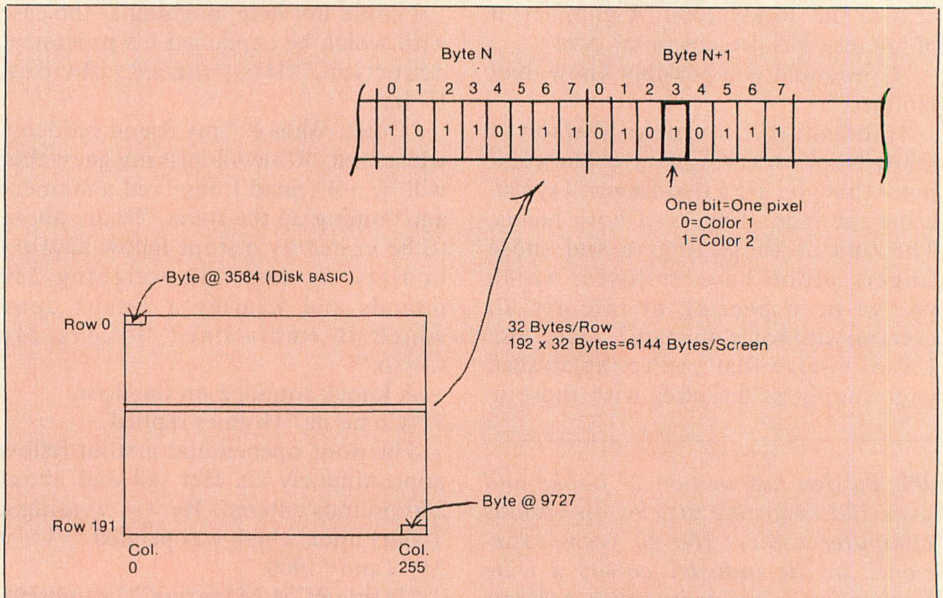
Byte N
Byte N+1
0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7
1 0 1 1 0 1 1 1 0 1 0 1 0 1 1 1
One bit=One pixel
0=Color 1
1=Color 2
Byte @ 3584 (Disk BASIC)
Row 0
32 Bytes/Row
192 x 32 Bytes=6144 Bytes/Screen
Byte @ 9727
Row 191
Col.
0
Col.
255

Figure 2: 256 x 192 Two-color Graphics Mode

Purcell-Smith. As a matter of fact, many printer codes are sent to the printer from BASIC by using the `CHR$( )` function. To set graphics mode, for example, you'd do a `PRINT#-2,CHR$(27);CHR$(XX)`. To print the graphics column we've been discussing, you'd do a `PRINT#-2,CHR$(191);`. Use a semicolon at the end if you don't wish to end the line."

"But," said he, "pray let us continue our conversation on the way to the location of the demise of that poor programmer chap."

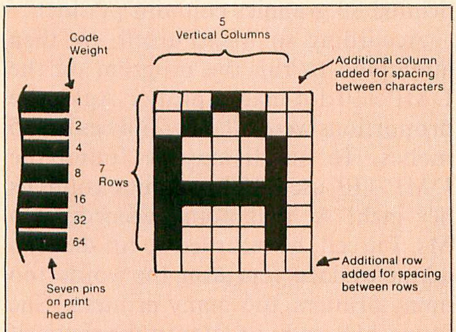
5
Vertical Columns
Code Weight
Additional column added for spacing between characters
1
2
4
8
16
32
64
7 Rows
Additional row added for spacing between rows
Seven pins on print head

Figure 3: Dot Representation of Characters and Graphics

There was a cab passing as the three of us came out of the building, and Holmes hailed it. "Beckenham, if you please."

Our driver pulled up at a greystone that housed a high-tech industry. He knocked on the door, and a tall, dour-looking man appeared.

"Ah, Lestrade," Holmes said. I see you have apprehended the killer and are putting the finishing touches to this little mystery."

"Yes, Mr. Holmes. It was a simple crime, really. Ms. Purcell was jealous of her chief programmer and afraid that even with affirmative action he would soon replace her at Slothware. She laced his coffee with arsenic as he was putting the final frills on a screen dump program."

"In that case, Lestrade, you won't mind if we have a look around, will you?"

"Of course not, Mr. Holmes, although I'm certain you won't be finding anything that I haven't seen already."

Holmes walked over to the programming area and picked up a listing next to a Color Computer. "Hmm. This appears to be a listing of the screen dump program in question, gentlemen. Let me peruse this briefly."

After intently peering at the document, the detective picked up a second listing. He then glanced around the room at several printers connected to the Color Computer. Taking out a pocket measuring tape, he made precise measurements of figures produced by the several printers.

"Watson, I think our task here is done. Lestrade, I think if you look in that programmer's desk drawer you'll find a vial of arsenic with *his* fingerprints on it, prompting you, I should think, to release Ms. Purcell from your custody. Let us be off, gentlemen."

Later that evening the three of us sat in front of a blazing fire in Holmes' Baker Street apartment.

"Mr. Holmes, I cannot thank you enough! My wife has been released and Lestrade has ruled the death a suicide."

"My blushes, Mr. Purcell-Smith. It was just a trifle."

"But, how did you know the death was a suicide?"

"I looked in some detail at the listing. It appears that the dead programmer had been trying for some time to design a screen dump program for the Color Computer. It was apparent he was having problems, however. The revision number of the BASIC program was number 45, indicating that he had attempted 44 times to write a program that successfully dumped the screen."

"But surely he must have known about the `CHR$` command, memory layout of the graphics screen and coding of graphics characters?"

"Yes, he was familiar with those functions for the screen dump program. However, he encountered a host of other obstacles. First, he found a problem in translating one pixel on the screen into one printable spot. Consider one approach he might have used. If he made one pixel equal to one printable character, then he would have had a screen dump of 25.6 inches in width by 32 inches high for the 256 by 192 mode, as the usual number of characters per width horizontally is 10 characters per inch and the number of vertical lines per inch is six. He was forced to use graphics mode to get a small enough listing.

"However, he knew he could not

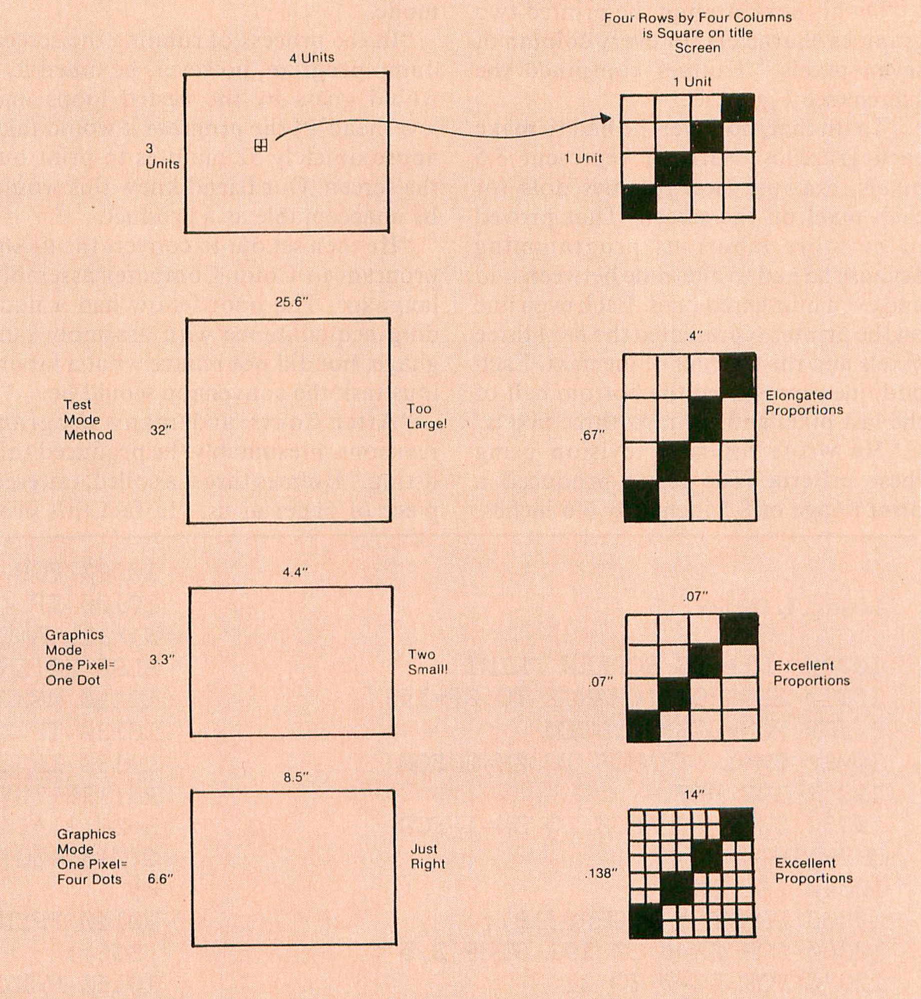
Four Rows by Four Columns is Square on title Screen
4 Units
3 Units
1 Unit
1 Unit
25.6"
Test Mode Method
32"
Too Large!
.4"
.67"
Elongated Proportions
4.4"
Graphics Mode One Pixel= One Dot
3.3"
Two Small!
.07"
.07"
Excellent Proportions
8.5"
Graphics Mode One Pixel= Four Dots
6.6"
Just Right
.14"
.138"
Excellent Proportions

Figure 4: Screen Dump Alternatives

print one pixel at a time on the printer, as seven vertical dots are printed for every graphics character. Therefore, he had to construct a graphics character made up of the seven vertical pixels on the screen. Here, I'll show you what I mean."

Holmes grabbed a nearby coal scuttle and drew a figure on it with a marking pen.

"He had to repeat that process for the entire row of 256 characters. When he coded the program, however, he found, to his amazement, that the figure produced by the screen dump was too small. The width was 256/60 inches wide, as most Radio Shack printers print 60 dots per inch in normal mode. The 4.4-inch width however, did not match the height. Most Radio Shack printers space graphics lines at 0.12 inches vertically, about eight lines per inch. As he had to print 27 3/7 graphics lines to produce 192 pixels vertically, he found the vertical dimension of the screen dump figure was 3.3 inches. A 4.4 by 3.3 inch figure wasn't to his liking.

"On his next attempt, he printed two graphics characters for every column of seven pixels." Holmes continued the sketch (see Figure 4).

"To do that, however, he had to make each graphics character represent 3.5 pixels, drawing two graphics dots for each pixel on the screen. That proved to be more laborious programming because he had to alternate between odd and even numbered lines. Each even line on the printer represented the next three pixels and the top half of the next. Each odd line represented the bottom half of the last pixel and the next three pixels.

"He wrote his next revision using these criteria. The result produced a print image of 8.5 inches by 6.6 inches. However, he encountered a strange problem. The line printer would not print the entire line of graphics characters without advancing to the next line. After much deliberation, indicated by revisions 20 through 23, he found that Color Computer BASIC counted the number of characters in each line and assumed each character was a text character. After 132 characters, in the typical case, BASIC would automatically send a new line to the printer, assuming that no printer would have greater than 13.2 inches for each line. That would be true had the printer been printing text, but not 512 graphics characters occupying 8.5 inches.

"In his next revision he cleared the BASIC variable that defined the number of characters per line to zero, eliminating *that* problem.

"The unfortunate programmer finally had a program that would print a 256 by 192 pixel screen in PMODE 4. With a few more modifications, he created a new revision that would also print in PMODE 3, the four-color 128 by 192 mode.

"In the process of running the screen dump program, however, he timed it. I would guess by the nested loops and 'overhead' of the program it would take approximately 52 minutes to print out the screen. Our friend knew this would be unacceptable as a product.

"He then set out to convert the BASIC program to Color Computer assembly language. The poor fellow had a nodding acquaintance with assembly language, but did not realize what a laborious task the conversion would be.

"After hours and many program revisions, presumably, he produced this listing." Holmes thrust a soiled, tattered piece of paper at us. "In fact this program did execute quite rapidly, about eight minutes for each screen print. One can surmise that he went with good spirits to his employer, Ms. Purcell, to show her his accomplishment. At this point he was many days overdue. Ms. Purcell has confirmed that he did, indeed, show her the program. When they went to try it on her CGP-220 printer, however, the proportions were quite far off — 6.4 inches horizontally by 6.6 inches vertically, as a matter of fact. Our friend was aghast until he found out that the CGP-220 printer printed 80 graphics columns per inch.

According to Ms. Purcell, he then attempted to run the program on the DMP-110 dot-matrix printer. Again the proportions were off — 4.2 inches by 5.5 inches. To his dismay he found the DMP-110 used 120 graphics columns per inch! At that point, according to Ms. Purcell, he returned to his desk, in a kind of daze, repeating the words 'too many printers, too many printers.' She found him an hour later in the rictus of death clutching his last listing, which I have here." Holmes pulled out the last listing and placed it in front of us.

"The ironic part of this story, gentlemen, is that his last listing worked for most Radio Shack printers. Such is the life of a programmer! Let us hope our friend has received his eternal reward for his efforts and is employed in a heavenly capacity on a system with one, and only one printer."

How to Use the Screen Print Programs

There are three versions of the screen print program. Each runs on any Radio Shack printer that has "dot graphics" capability, including earlier printers such as the LPVIII, DMP-100, DMP-

Listing 1: BASPRINT

```
10000 'HI-RES SCREEN PRINT
10010 ZP=3584 'CHANGE TO ZP=153
6 FOR NON-DISK SYSTEM
10020 ZM=1 'CHANGE TO ZM=2 FOR
128 X 192 RES.
10030 ZW=0 'CHANGE TO ZW=1 FOR
DMP-110
10040 ZS=-ZM
10050 PRINT #-2,CHR$(18);
10060 FOR ZR=0 TO 191 STEP 3.5
10070 FOR ZC=0 TO 31
10080 FOR ZB=7 TO 0 STEP ZS : Z
Z=2^ZB : IF ZM=2 THEN ZZ=ZZ+2^(
ZB-1)
10090 FOR ZN=0 TO 3
10100 IF (PEEK(ZP+ZC+(INT(ZR)+Z
N)*32) AND ZZ)>0 THEN ZG(ZN)=1
ELSE ZG(ZN)=0
10110 NEXT ZN
10120 IF ZR=189 THEN ZG(3)=0
10130 IF ZR=INT(ZR) THEN ZG$=CH
R$(128+ZG(0)*3+ZG(1)*12+ZG(2)*4
8+ZG(3)*64) ELSE ZG$=CHR$(128+Z
G(0)*1+ZG(1)*6+ZG(2)*24+ZG(3)*9
6)
10140 PRINT #-2,STRING$(ZM*2+ZW
,ZG$);
10150 NEXT ZB,ZC : PRINT #-2 :
NEXT ZR
10160 PRINT #-2,CHR$(30); : RET
URN
```

400, DMP-2100, and so forth. The screen print programs also run on newer Radio Shack printers when the printers are set to the Tandy character set. Newer printers have a switch selection that enables either Tandy or IBM characters to be used. The reason for this is the printers are used in the Tandy 1000, 1200, 2000 and 3000 — systems which are IBM PC compatible. These systems not only use a different character set, but also use a different escape code sequence, one which is Epson printer compatible. Unfortunately for the programmer in our story, the new printers arrived too late. The Epson escape-code sequence uses an eight-bit encoding which is a great deal easier to work with than the seven-bit coding.

The first program, shown in Listing 1, is a BASIC program that works for either PMODE 4 (256 by 192) or PMODE 3 (128 by 192). To use the program, key it in as a subroutine starting at Line 10000. Then call it from your BASIC program at any time to print out the graphics screen.

Before you do, however, change Line 10010 to ZP=1536 for a nondisk system or to ZP=3584 for a disk system. Change Line 10020 to ZM=1 for PMODE 4 or to ZM=2 for PMODE 3. If you have a printer such as the DMP-110 which prints at a dense resolution in graphics, change Line 10030 to ZW=1; otherwise leave ZW=0. The program takes about 50 minutes to execute.

The second version of the program is an assembly language implementation of the same program shown in Listing 1. In this program we tried to do a straight translation between the BASIC version and assembly language so that you could see the flow in assembly language. Change the variables where indicated for disk/nondisk, PMODE 3 or 4, and high-density printing at the beginning of the program. Assemble and load the program using the Disk *EDTASM* or another assembler. The program is designed to execute at location $3E00, so you'll have to do a CLEAR 100,&H3DFF in your BASIC program before loading the program. You can then call the machine language code of the program by defining the location of the program with a DEFUSR0=&H3E04 and an A=USR0(0) or with a POKE 126,XX: POKE 127,XX and an A=USR(0) in non-Extended BASIC. This assembly language version takes about 8 minutes to print.

If you would rather use the program as a BASIC version, enter the program

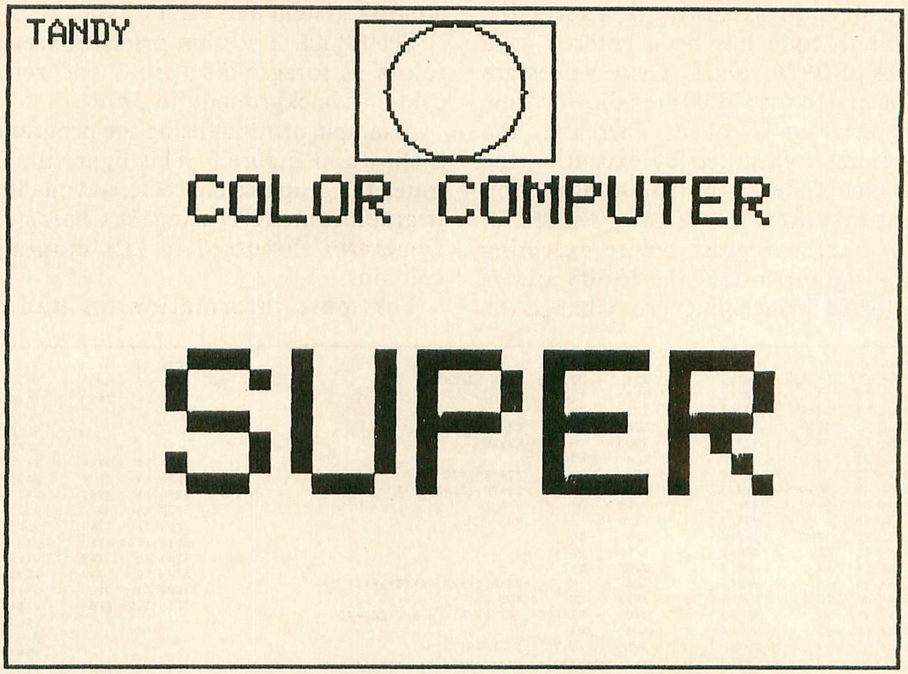

Figure 5: Sample Printout Using Hi-Res Program

Listing 2:

```
                    00100 *________________________________________
                    00110 *HI-RES SCREEN PRINT
3E00                00120          ORG     $3E00
                    00130 *ZP=3584 'CHANGE TO ZP=1536 FOR NON-DISK SYSTEM
3E00      0E00      00140 ZP       FDB     3584
                    00150 *ZM=1 'CHANGE TO ZM=2 FOR 128X192 RES
3E02      01        00160 ZM       FCB     1
                    00170 *ZW=0  'CHANGE TO ZW=1 FOR DMP-110
3E03      00        00180 ZW       FCB     0
                    00190 *________________________________________
                    00200 *ZS=-ZM
                    00210 *----------------------------------------
3E04 B6   3E02      00220 START    LDA     ZM
3E07 40             00230          NEGA            -ZM
3E08 B7   3F46      00240          STA     ZS      INIT ZS
                    00250 *----------------------------------------
                    00260 *PRINT #-2,CHR$(18);
                    00270 *----------------------------------------
3E0B 86   12        00280          LDA     #18     SET GRAPHICS
3E0D BD   3F36      00290          JSR     PRINT
                    00300 *----------------------------------------
                    00310 *FOR ZR=0 TO 191 STEP 3.5
                    00320 *----------------------------------------
3E10 4F             00330          CLRA            0
3E11 B7   3F45      00340          STA     ZR      INITIALIZE ZR
3E14 B7   3F48      00350          STA     ZT
                    00360 *----------------------------------------
                    00370 *FOR ZC=0 TO 31
                    00380 *----------------------------------------
3E17 4F             00390 HIR060   CLRA
3E18 B7   3F42      00400          STA     ZC      INITIALIZE ZC
                    00410 *----------------------------------------
                    00420 *FOR ZB=7 TO 0 STEP ZS
                    00430 *----------------------------------------
3E1B 86   07        00440 HIR070   LDA     #7
3E1D B7   3F43      00450          STA     ZB      INIT ZB
                    00460 *----------------------------------------
                    00470 *ZZ=2^ZB : IF ZM=2 THEN ZZ=ZZ+2^(ZB-1)
                    00480 *----------------------------------------
3E20 F6   3F43      00490 HIR080   LDB     ZB      GET # OF TIMES
3E23 4F             00500          CLRA
3E24 1F   01        00510          TFR     D,X
3E26 C6   01        00520          LDB     #1
3E28 8C   0000      00530          CMPX    #0
3E2B 27   10        00540 HIR086   BEQ     HIR087  GO IF 0
3E2D 58             00550          LSLB            SHIFT LEFT
3E2E 30   1F        00560          LEAX    -1,X    DECREMENT
3E30 26   F9        00570          BNE     HIR086  CONTINUE IF NOT DONE
3E32 B6   3E02      00580          LDA     ZM
3E35 81   02        00590          CMPA    #2
3E37 26   04        00600          BNE     HIR087
3E39 54             00610          LSRB
3E3A FA   3F47      00620          ORB     ZZ
3E3D F7   3F47      00630 HIR087   STB     ZZ
                    00640 *----------------------------------------
                    00650 *FOR ZN=0 TO 3
                    00660 *----------------------------------------
3E40 108E 0000      00670          LDY     #0
                    00680 *----------------------------------------
                    00690 *IF (PEEK(ZP+ZC+(INT(ZR)+ZN)*32) AND ZZ)>0 THEN
                    00700 *ZG(ZN)=1 ELSE ZG(ZN)=0
                    00710 *----------------------------------------
```

shown in Listing 3. This is the exact same version as Listing 2, except the machine code has been entered as a series of `DATA` values. These values are relocated to the $3E00 area the first time the program is called. Thereafter the program is executed by executing the machine code at the $3E00 area. You must first do a `CLEAR 100, &H3DFF` in your BASIC program before executing the program so that the $3E00 area is protected from BASIC use. Change the variables as before for the `PMODE`, disk/nondisk system and printer type.

The `PMODE 3` version prints nonzero colors as foreground (print) and zero colors as background (no print).

A sample printout using the program is shown in Figure 5. This figure illustrates the graphics characters available in graphics mode by using the Character Generator discussed in last month's column.

For more information on Radio Shack printers, pick up a copy of my Radio Shack book, *How to Use Your Radio Shack Printer*. Although light on assembly language topics, it does go into detail about various printer modes, including graphics figures and forms.

Next month we'll have more assembly language topics. In the meantime, keep on assemblin'. ☐

```
3E44 4F           00720 HIR090  CLRA
3E45 A7   A9 3F49 00730         STA     ZG,Y     ELSE ZG(ZN)=0
3E49 1F   20      00740         TFR     Y,D
3E4B F7   3F44    00750         STB     ZN
3E4E F6   3F45    00760         LDB     ZR       ZR
3E51 FB   3F44    00770         ADDB    ZN       ZR+ZN
3E54 86   20      00780         LDA     #32
3E56 3D           00790         MUL              (ZR+ZN)*32
3E57 F3   3E00    00800         ADDD    ZP       ZP+ZC+(ZR+ZN)*32
3E5A 34   06      00810         PSHS    D
3E5C 4F           00820         CLRA
3E5D F6   3F42    00830         LDB     ZC
3E60 E3   E1      00840         ADDD    ,S++
3E62 1F   01      00850         TFR     D,X
3E64 A6   84      00860         LDA     ,X       PEEK(ZP+ZC+(ZR+ZN)*32)
3E66 B4   3F47    00870         ANDA    ZZ       AND ZZ
3E69 27   06      00880         BEQ     HIR100   IF (PEEK)... AND ZZ)=0
3E6B 86   01      00890         LDA     #1
3E6D A7   A9 3F49 00900         STA     ZG,Y     THEN ZG(ZN)=1
                  00910 *----------------------------------------
                  00920 *NEXT ZN
                  00930 *----------------------------------------
3E71 31   21      00940 HIR100  LEAY    +1,Y     STEP 1
3E73 1F   20      00950         TFR     Y,D      GET ZN
3E75 1083 0004    00960         CMPD    #4       =4?
3E79 26   C9      00970         BNE     HIR090   GO IF NO
3E7B B6   3F45    00980         LDA     ZR
3E7E 81   BD      00990         CMPA    #189
3E80 26   08      01000         BNE     HIR105
                  01010 *----------------------------------------
                  01020 *IF ZR=189 THEN ZG(3)=0
                  01030 *----------------------------------------
3E82 86   00      01040         LDA     #0
3E84 31   3F      01050         LEAY    -1,Y
3E86 A7   A9 3F49 01060         STA     ZG,Y
                  01070 *----------------------------------------
                  01080 *IF ZR/2=INT(ZR/2) THEN ZG$=CHR$(128+ZG(0)*3+
                  01090 *  ZG(1)*12+ZG(2)*48+ZG(3)*64
                  01100 *----------------------------------------
3E8A B6   3F48    01110 HIR105  LDA     ZT       GET ZT
3E8D 84   01      01120         ANDA    #1       TEST ODD/EVEN
3E8F 26   2B      01130         BNE     HIR110   GO IF ODD
3E91 B6   3F4C    01140         LDA     ZG+3
3E94 C6   40      01150         LDB     #64
3E96 3D           01160         MUL              ZG(3)*64
3E97 34   04      01170         PSHS    B
3E99 B6   3F4B    01180         LDA     ZG+2
3E9C C6   30      01190         LDB     #48
3E9E 3D           01200         MUL              ZG(2)*48
3E9F EB   E4      01210         ADDB    ,S       ZG(2)*48+ZG(3)*64
3EA1 E7   E4      01220         STB     ,S
3EA3 B6   3F4A    01230         LDA     ZG+1
3EA6 C6   0C      01240         LDB     #12
3EA8 3D           01250         MUL              ZG(1)*12
3EA9 EB   E4      01260         ADDB    ,S       ZG(1)*12+ZG(2)*48+ZG(3)*64
3EAB E7   E4      01270         STB     ,S
3EAD B6   3F49    01280         LDA     ZG
3EB0 C6   03      01290         LDB     #3
3EB2 3D           01300         MUL              ZG(0)*3
3EB3 EB   E0      01310         ADDB    ,S+      ZG(0)*3+ZG(1)*12+ZG(2)*48+...
3EB5 CB   80      01320         ADDB    #128     128+ ...
3EB7 F7   3F49    01330         STB     ZG
3EBA 20   29      01340         BRA     HIR120
                  01350 *----------------------------------------
                  01360 *ELSE ZG$=CHR$(128+ZG(0)*1+ZG(1)*6+ZG(2)*24+ZG(3)*96
                  01370 *----------------------------------------
3EBC B6   3F4C    01380 HIR110  LDA     ZG+3
3EBF C6   60      01390         LDB     #96
3EC1 3D           01400         MUL              ZG(3)*96
3EC2 34   04      01410         PSHS    B
3EC4 B6   3F4B    01420         LDA     ZG+2
3EC7 C6   18      01430         LDB     #24
3EC9 3D           01440         MUL              ZG(2)*24
3ECA EB   E4      01450         ADDB    ,S       ZG(2)*24+ZG(3)*96
3ECC E7   E4      01460         STB     ,S
3ECE B6   3F4A    01470         LDA     ZG+1
3ED1 C6   06      01480         LDB     #6
3ED3 3D           01490         MUL              ZG(1)*6
3ED4 EB   E4      01500         ADDB    ,S       ZG(1)*6+ZG(2)*24+ZG(3)*96
3ED6 E7   E4      01510         STB     ,S
3ED8 B6   3F49    01520         LDA     ZG       ZG(0)*1
3EDB C6   01      01530         LDB     #1
3EDD 3D           01540         MUL
3EDE EB   E0      01550         ADDB    ,S+      ZG(0)*1+ZG(1)*6+ZG(2)*24+ZG(3)*
96
3EE0 CB   80      01560         ADDB    #128
3EE2 F7   3F49    01570         STB     ZG
                  01580 *----------------------------------------
                  01590 *PRINT #-2,STRINGS(ZM*2+ZW,ZG$)
                  01600 *----------------------------------------
3EE5 F6   3E02    01610 HIR120  LDB     ZM
3EE8 58           01620         LSLB             ZM*2
3EE9 FB   3E03    01630         ADDB    ZW
3EEC 1F   01      01640         TFR     D,X
3EEE B6   3F49    01650 HIR125  LDA     ZG
```

```
3EF1 BD   3F36    01660         JSR     PRINT
3EF4 30   1F      01670         LEAX    -1,X
3EF6 26   F6      01680         BNE     HIR125
                  01690 *----------------------------------------
                  01700 *NEXT ZB,ZC
                  01710 *----------------------------------------
3EF8 B6   3F46    01720 HIR130  LDA     ZS       GET ZS
3EFB 34   02      01730         PSHS    A
3EFD B6   3F43    01740         LDA     ZB
3F00 AB   E0      01750         ADDA    ,S+      STEP ZS
3F02 B7   3F43    01760         STA     ZB
3F05 102C FF17    01770         LBGE    HIR080   GO IF ZB>=0
3F09 7C   3F42    01780         INC     ZC
3F0C B6   3F42    01790         LDA     ZC
3F0F 81   20      01800         CMPA    #32      ZC=32?
3F11 1026 FF06    01810         LBNE    HIR070   GO IF NO
                  01820 *----------------------------------------
                  01830 *PRINT #-2
                  01840 *----------------------------------------
3F15 86   0D      01850         LDA     #$D      CR
3F17 BD   3F36    01860         JSR     PRINT
                  01870 *----------------------------------------
                  01880 *NEXT ZR
                  01890 *----------------------------------------
3F1A B6   3F48    01900         LDA     ZT       GET ZT
3F1D 84   01      01910         ANDA    #1
3F1F BB   3F45    01920         ADDA    ZR
3F22 8B   03      01930         ADDA    #3
3F24 B7   3F45    01940         STA     ZR
3F27 7C   3F48    01950         INC     ZT
3F2A 81   C0      01960         CMPA    #192     AT END?
3F2C 1026 FEE7    01970         LBNE    HIR060   GO IF NO
                  01980 *----------------------------------------
                  01990 *PRINT #-2,CHR$(30);
                  02000 *----------------------------------------
3F30 86   1E      02010         LDA     #30      RESET GRAPHICS
3F32 BD   3F36    02020         JSR     PRINT
                  02030 *----------------------------------------
                  02040 *RETURN
                  02050 *----------------------------------------
3F35 39           02060         RTS
                  02070 *
3F36 C6   FE      02080 PRINT   LDB     #-2
3F38 D7   6F      02090         STB     $6F
3F3A AD   9F A002 02100         JSR     [$A002]
3F3E 4F           02110         CLRA
3F3F 97   9C      02120         STA     $9C
3F41 39           02130         RTS
                  02140 *
3F42      00      02150 ZC      FCB     0
3F43      00      02160 ZB      FCB     0
3F44      00      02170 ZN      FCB     0
3F45      00      02180 ZR      FCB     0
3F46      00      02190 ZS      FCB     0
3F47      00      02200 ZZ      FCB     0
3F48      00      02210 ZT      FCB     0
3F49      00      02220 ZG      FCB     0
          3E04    02230         END     START

00000 TOTAL ERRORS
```

See You at
RAINBOWfest-Princeton
October 17-19

```
250 ......145
370 .......65
520 ......202
660 ......249
780 ......113
920 ......203
END ......35
```

Listing 3: MLPRINT

```
100 'HIGH-RES SCREEN PRINT TEST
110 CLEAR 100,&H3DFF
120 FOR I=&H3E00 TO &H3F49
130 READ A: POKE I,A
140 NEXT I
150 DEFUSR0=&H3E04
160 SCREEN 1,0
170 PMODE 4,1
180 PCLS
190 FOR I=1 TO 5
200 CIRCLE (RND(255),RND(191)),
RND(100)
210 LINE (RND(255),RND(191))-(R
ND(255),RND(191)),PSET,B
220 NEXT I
230 A=USR0(0)
240 GOTO 240
250 '===========================
260 DATA &HE ,&H0 ,&H1 ,&H0
270 DATA &HB6,&H3E,&H2 ,&H40
280 DATA &HB7,&H3F,&H46,&H86
290 DATA &H12,&HBD,&H3F,&H36
300 DATA &H4F,&HB7,&H3F,&H45
310 DATA &HB7,&H3F,&H48,&H4F
320 DATA &HB7,&H3F,&H42,&H86
330 DATA &H7 ,&HB7,&H3F,&H43
340 DATA &HF6,&H3F,&H43,&H4F
350 DATA &H1F,&H1 ,&HC6,&H1
360 DATA &H8C,&H0 ,&H0 ,&H27
370 DATA &H10,&H58,&H30,&H1F
380 DATA &H26,&HF9,&HB6,&H3E
390 DATA &H2 ,&H81,&H2 ,&H26
400 DATA &H4 ,&H54,&HFA,&H3F
410 DATA &H47,&HF7,&H3F,&H47
420 DATA &H10,&H8E,&H0 ,&H0
430 DATA &H4F,&HA7,&HA9,&H3F
440 DATA &H49,&H1F,&H20,&HF7
450 DATA &H3F,&H44,&HF6,&H3F
460 DATA &H45,&HFB,&H3F,&H44
470 DATA &H86,&H20,&H3D,&HF3
480 DATA &H3E,&H0 ,&H34,&H6
490 DATA &H4F,&HF6,&H3F,&H42
500 DATA &HE3,&HE1,&H1F,&H1
510 DATA &HA6,&H84,&HB4,&H3F
520 DATA &H47,&H27,&H6 ,&H86
530 DATA &H1 ,&HA7,&HA9,&H3F
540 DATA &H49,&H31,&H21,&H1F
550 DATA &H20,&H10,&H83,&H0
560 DATA &H4 ,&H26,&HC9,&HB6
570 DATA &H3F,&H45,&H81,&HBD
580 DATA &H26,&H8 ,&H86,&H0
590 DATA &H31,&H3F,&HA7,&HA9
600 DATA &H3F,&H49,&HB6,&H3F
610 DATA &H48,&H84,&H1 ,&H26
620 DATA &H2B,&HB6,&H3F,&H4C
630 DATA &HC6,&H40,&H3D,&H34
640 DATA &H4 ,&HB6,&H3F,&H4B
650 DATA &HC6,&H30,&H3D,&HEB
660 DATA &HE4,&HE7,&HE4,&HB6
670 DATA &H3F,&H4A,&HC6,&HC
680 DATA &H3D,&HEB,&HE4,&HE7
690 DATA &HE4,&HB6,&H3F,&H49
700 DATA &HC6,&H3 ,&H3D,&HEB
710 DATA &HE0,&HCB,&H80,&HF7
720 DATA &H3F,&H49,&H20,&H29
730 DATA &HB6,&H3F,&H4C,&HC6
740 DATA &H60,&H3D,&H34,&H4
750 DATA &HB6,&H3F,&H4B,&HC6
760 DATA &H18,&H3D,&HEB,&HE4
770 DATA &HE7,&HE4,&HB6,&H3F
780 DATA &H4A,&HC6,&H6 ,&H3D
790 DATA &HEB,&HE4,&HE7,&HE4
800 DATA &HB6,&H3F,&H49,&HC6
810 DATA &H1 ,&H3D,&HEB,&HE0
820 DATA &HCB,&H80,&HF7,&H3F
830 DATA &H49,&HF6,&H3E,&H2
840 DATA &H58,&HFB,&H3E,&H3
850 DATA &H1F,&H1 ,&HB6,&H3F
860 DATA &H49,&HBD,&H3F,&H36
870 DATA &H30,&H1F,&H26,&HF6
880 DATA &HB6,&H3F,&H46,&H34
890 DATA &H2 ,&HB6,&H3F,&H43
900 DATA &HAB,&HE0,&HB7,&H3F
910 DATA &H43,&H10,&H2C,&HFF
920 DATA &H17,&H7C,&H3F,&H42
930 DATA &HB6,&H3F,&H42,&H81
940 DATA &H20,&H10,&H26,&HFF
950 DATA &H6 ,&H86,&HD ,&HBD
960 DATA &H3F,&H36,&HB6,&H3F
970 DATA &H48,&H84,&H1 ,&HBB
980 DATA &H3F,&H45,&H8B,&H3
990 DATA &HB7,&H3F,&H45,&H7C
1000 DATA &H3F,&H48,&H81,&HC0
1010 DATA &H10,&H26,&HFE,&HE7
1020 DATA &H86,&H1E,&HBD,&H3F
1030 DATA &H36,&H39,&HC6,&HFE
1040 DATA &HD7,&H6F,&HAD,&H9F
1050 DATA &HA0,&H2 ,&H4F,&H97
1060 DATA &H9C,&H39,&H0 ,&H0
1070 DATA &H0 ,&H0 ,&H0 ,&H0
1080 DATA &H0 ,&H0
```

KISSable OS-9

Good Times with OS-9 on the Hard Disk

By Dale L. Puckett
Rainbow Contributing Editor

It's hard to believe it's almost fall — especially as I start to write this edition of KISSable OS-9 during the last week of May. Yet, it's almost harder to believe I have 576K of RAM in my Color Computer with another 256K waiting to be installed, while I sit here playing with the new 15-megabyte hard disk from Tandy. This month we'll share some ideas about organizing massive amounts of data on a hard disk, and work through several patches of randomness as we try to answer some of the questions you've posed during the past few months.

I try to take my marching orders from you — that's why we attempt to answer at least a few questions each month. If you have a question, please send it to us and we'll share it with everyone. And don't forget, if you have any good ideas or tips you would like to share with fellow OS-9 users send them to us here at "KISSable OS-9" and we'll sure try to get them in print. The same goes for short procedures and program listings. Some of the ideas you have sent in the past have been clever enough to impress a lot of veteran OS-9 programmers. Keep up the good work.

Fate is often unpredictable. Less than a week after Fran McGee loaned me one of the new Tandy 15-megabyte hard disk drives and a new hard disk controller cartridge, my old gray CoCo bit the dust. To solve the problem we rushed out and bought a CoCo 2 with a matching white Multi-Pak Interface and went to work.

Installation of the Tandy hard disk drive is very easy. To use it, you need a Color Computer with 64K of memory, a Multi-Pak Interface, at least one floppy disk drive and controller, the Color Computer Hard Disk Controller, Version 2.00.00 of the OS-9 operating system and the hard disk drive itself.

After making sure the Color Computer and Multi-Pak Interface are turned off, plug the Hard Disk Controller into slot 3 of the Multi-Pak Interface. This is the second slot from the back. The floppy disk controller stays in slot 4. The two controllers must be in their assigned slots because the OS-9 floppy and hard disk drivers have been programmed to find them there. If you change slots, the drives will not work.

After you have plugged in the cartridges, connect the 50-pin ribbon cable from the hard disk controller cartridge to the hard disk drive. The ribbon cable must exit toward the rear of the Multi-Pak Interface — or toward the side of the Hard Disk Controller with the label. After the cable is installed, turn on the Multi-Pak, the Color Computer and the floppy and hard disk drives, in that order.

When turning on the hard disk drive for the first time you will not find any information on it. It must be formatted before you can use it to store OS-9 programs and data. To do this, first load the /h0 device descriptor and the hard disk driver modules. Both are stored in the modules directory of the boot/config disk supplied with OS-9 Version 2.00.00. The descriptor is stored in a file named h0—15.dd and the driver is stored in CCHDisk.dr. After these modules are loaded use the standard OS-9 format utility command to initialize the hard disk drive.

Once you have formatted the hard disk, you will probably want to use the *Config* program to make a new OS-9 boot file that contains /h0 and CCHDisk. After you do this, OS-9 will boot from the floppy containing the OS-9 boot file, but it will start up with the current execution directory and current data directory set to /h0/cmds and /h0. It's amazing!

This drive is almost as fast as a RAM disk. After you install a hard disk drive, OS-9 becomes a whole new ball game. However, if you use a number of application programs on the Color Computer that need a lot of memory, be very careful about the number of modules you load into the OS-9 boot file. To use the C compiler, for example, you must strip OS-9 boot down to the bare minimum. You can't remove the floppy disk drivers, but you can get rid of the printer descriptor, /p, and the related driver, Printer, and a few other modules. If you use

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a RAM disk in addition to the hard disk you will really find memory space full — but it's worth it.

Your approach to computing will definitely change when you get a hard disk, and your enjoyment level will soar. You will eventually need to get organized, however. If you don't, you'll soon be lost in a sea of directories and subdirectories.

I was asked an unusual question at RAINBOWfest Chicago. "How should I set up my disk directories? Is it best to use a tall skinny directory structure or should I spread them out in a horizontal fashion?"

Organizing a disk is a personal matter but perhaps we can help with an overview of the possibilities available when using OS-9. To start, remember it was a tall skinny directory structure you were forced into when using Disk BASIC, CP/M, Flex or even the first several versions of MS-DOS on an IBM PC. Now remember the long lists you had to search when finding a stray file. It took forever, didn't it? Let's move forward and show how you can use OS-9's hierarchical file system to get organized.

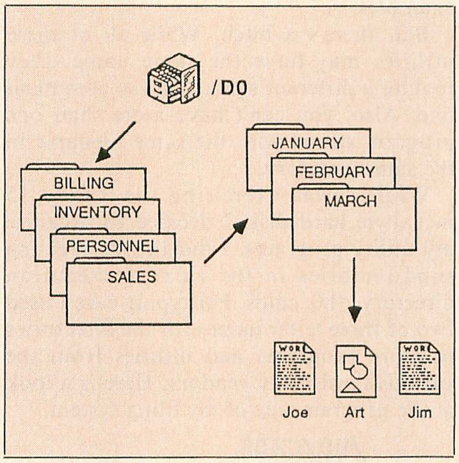
The most basic element in the OS-9 filing system is the individual file. Files most often contain data you are interested in — the text processing documents holding letters you have written or spreadsheets showing a profit and loss statement, for example. But, OS-9 files can also contain directories to tell the system how to find other information, or even the programs needed to manipulate information.

To get a handle on the OS-9 filing system, think of each mounted disk as a large filing cabinet. Inside that filing cabinet, each of the directories at the first level can be compared to a number of individual drawers. Other directories stored in these first level directories are called subdirectories. You can liken them to file folders. And finally, the individual files containing your data can be compared to the individual pieces of paper stored in a file folder.

The top level of the OS-9 filing system on any particular disk is the root directory of that disk. The directories stored in the root directory usually give a user access to application programs and other system data he may need. For example, the standard system disk with the OS-9 operating system from Tandy contains two files and three individual directories. The two files, OS-9 boot and startup, are used to start the system. The three directories hold programs and other information about the computer. The cmds directory contains all of the utility command programs to maintain data files. The DEFS file contains symbolic definitions of all key memory addresses used by the OS-9 operating system. And finally, the SYS directory contains information OS-9 uses occasionally. Included is a message of the day which is sent to every new user signing on the system and a password file that ensures only authorized users have access to the system.

On a multi-user, OS-9 based computer the system manager often sets up a directory for each user. These user directories are usually placed in the root directory of the disk. It is then up to the individual user to organize the data in his own directory. Since you are the user, the system manager's move places the ball squarely in your court. Let's look at one way to play the game.

First, we'll assume you don't have a hard disk. Set up directories to match the many jobs you have to do. For example, if you supervise a large staff, do the billing, track an inventory and keep an eye on the sales team, you will want to set up at least four directories in the root directory of your personal disk. The first few levels of the filing system might look something like this:



In the directory named Billing, you could create two sub-directories or folders — Sent and Received. In Inventory you might want to set up folders for Completed Widgets and Spare Parts. In the Personnel directory you will need at least two folders — one for Evaluations and another for Payroll. And finally, in the Sales folder you can create 12 folders or sub-directories, one for each month. Each of these folders would hold files containing each sales person's report for the month plus any charts or graphics needed to make a clear report to the boss.

If you are the only user and set up a filing system on your own disk, the structure of the disk would be similar to that in the figure above. If you are working in an office with two other managers and using a hard disk for storage, the system manager will most likely have created three directories — one for each of you in the root directory of the hard disk. In that case, simply move your top directory level to the hard disk from your floppy disk.

If your name is Fred and one of the three user directories set up by the system manager is named Fred, then the pathlist to your Billing folder would become /h0/fred/billing.

And, the complete pathlist to Jim's sales report for January would be:

/h0/fred/sales/january/jim.

It is easy to find a particular file after setting up a logical filing system similar to the one above. For example, if you need to check out Joe's last personnel evaulation, you need to look in a file with a pathlist like this:

/d0/fred/personnel/evaluations/
february/sam

It's easy to find a file when it is stored in a logical place. Typing a long pathlist like this can get old fast, but since you most likely work on all of your personnel reports at the same time, you can take advantage of one of OS-9's handy features and set the current data directory to the current month's reports with this command line:

```
OS9: chd /d0/fred/personnel/
  evaluations/feb
```

Then, all you need to type is:

```
OS9: list Sam
```

The first command line above sets the current data directory to:

/d0/fred/personnel/evaluations/feb.

All of these directories contain files holding data. And since you know your business better than anyone else, OS-9 lets you organize data directories the way you have organized your business. After this, you will be able to find files quickly. And, once your disk is organized, OS-9's chd command makes it easy to change the current data directory to any particular set of files.

OS-9 Helps Organize Programs Too

OS-9 files can also contain programs; its designers moved one up on UNIX and added a second current directory. This second working directory is called the current execution directory. It is used to hold files containing 6809 object code and intermediate code from one of the many OS-9 languages that can be run on your computer.

When booting OS-9 on the Color Computer on a floppy disk system, a program called *sysgo* is executed automatically and one of the first things it does is set up your current directories. After *sysgo* runs, the current execution directory will be /d0/cmds and your current data directory will be /d0.

The "current" directories apply only to the disk mounted in the drive /d0 when you boot the system. If you remove that disk and insert another, the system records are no longer "current." You must use the OS-9 chd (change current data directory) and chx (change current execution directory) utility commands before trying to do any work with the new disk. If you don't do this, the system gets lost because it will look for the directories on the new disk at the same location where it found them on the old disk.

When it doesn't find them there and loads something inappropriate into memory, strange things often happen.

By the way, if you own a Tandy hard disk and have installed its device descriptor, /h0, and its device driver, CCHDISK, in your OS-9 boot file, the *sysgo* program in OS-9 Version 2.00.00 automatically sets the current execution directory to /h0/cmds and the current data directory to /h0 each time you start the system.

If you decide to run a program, *Dir* for example, OS-9 looks for *Dir* and then runs it. However, before OS-9 looks on the disk drives, it checks to see if the program is already in memory. To do this it looks for the name typed on the command line in its module directory. If OS-9 finds *Dir* in its module directory, it links to it and runs it immediately. No disk access is needed.

But what happens if *Dir* is not in memory? OS-9 looks in the current execution directory and tries to find a file named *Dir*. If it finds a file with the right name in this directory, it assumes it is executable code, loads it into memory and runs it.

And finally, if OS-9 doesn't find *Dir*, in the current execution directory it makes one more try — this time in the current data directory. But, if OS-9 finds *Dir* in the current data directory it won't treat it like a program. It treats it like a data file. More specifically, it assumes this data file contains a procedure file.

An OS-9 procedure file is similar to a UNIX script file. A procedure file contains a list of OS-9 commands which are read into the shell. Each time a command line is read, it is run just as if you had typed it. The process continues until OS-9 receives an end of file signal from the procedure file.

In the case of the intermediate code from OS-9 languages, execution of the language's run time package is also automatic. Packed BASIC09 programs, for example, are executed by a run time interpreter named Runb. When you type the name of a file stored in the current execution directory containing packed BASIC09 code, OS-9 loads this i-code into memory just like it were 6809 object code.

However, before OS-9 runs the code in any module it checks the information in the module header to find out what type of code is in the module. When it finds out you have loaded packed BASIC09 i-code, it knows that Runb is needed to run the program. So, OS-9 automatically loads Runb and executes it with the name of the module as a parameter. All of this work is transparent and all you see on the screen is the output of the BASIC09 program.

When you first purchase Tandy's version of OS-9 there are enough utility command files stored in the directory /d0/cmds on the OS-9 system master to fill several screen pages when you list the filenames. After you have added a few dozen of your own favorite application programs and third party utility command packages, it becomes almost impossible to find a file in a directory listing on the screen. The problem is complicated by the fact that the *Dir* utility command in the 6809 version of OS-9 does not alphabetize the directory listing for you. The new 68K version of OS-9 lists the contents of the directories in alphabetical order.

So, if you use a hard disk and own hundreds of programs, you need to organize a set of directories on the hard disk using a method similar to the one for organizing your data directories.

For example, to keep current I try to take a look at most all OS-9 software. Many of the third party utility packages contain similar programs and more than one developer may use the same name. The standard UNIX-like utilities, *ls* and *mv* are good examples.

But, there's a hitch. While all of these utilities may have the same name, they require a different syntax on the command line. Also, you can't have more than one program stored with the same filename in the same directory.

While I was exercising the Tandy 15 megabyte hard disk, I decided to organize my utility programs. I did this by creating subdirectories in the current execution directory, /h0/cmds. For typing ease I used two or three letter names for the directories to store programs and utilities from the various third party vendors. Here is a look at the program side of my filing system.

```
      /H0/CMDS
CW DPJ FHL MW RS SG
```

Computerware's utilities are stored in the directory, CW; D. P. Johnson's hackers kits and utility packages live in DPJ; products from Frank Hogg Laboratory are stored in FHL; Microware's toolkit is saved in MW; Tandy products live in RS and finally Steve Goldberg's *Utilipak* programs are run from SG.

Using the standard OS-9 shell from the Tandy release of OS-9, I must type the complete pathlist to a utility in one of these directories. That's why I used the short directory names. For example, if I want to run Steve Goldberg's version of *ls*, I merely type:

```
OS9: sg/ls
```

If I wanted to use Brian Lantz's verison of *ls* from Computerware, I would have typed:

```
OS9: cw/ls
```

But, by using the new kshell in the *Advanced Utilities* package from Computerware, I make this operation automatic, going as far as to tell OS-9 which vendors command I want to have priority. To do this I use the new path command built into kshell.

```
OS9: path=cw:sg:mw:dpj:fhl:rs
```

After typing this command line, I receive very few "Error #216 Program Not Found" errors. The kshell first searches /h0/cmds for the filename typed. If it doesn't find it there, it looks in the subdirectories, CW, SG, MW, DPJ, FHL and RS in that order. It runs the first program stored in a file with the name I have typed. In other words, if the CW subdirectory contains an *ls* command, the *ls* in the *DPJ* directory will never be run as long as this path definition is active. However, I could always select it manually and override the default path by typing:

```
OS9: dpj/ls
```

While getting the hard disk organized you will sometimes move a lot of files back and forth from one directory to another. The *DirCopy* utility from Computerware's *Disk Fix and Utilities* package is almost indispensable during this process. Use a command like this:

```
OS9: dircopy /H0/FIRST_DIREC
  TORY /H0/SECOND_DIRECTORY
```

DirCopy can be told to let you confirm each copy command. This means you can select the files you want to copy from one directory to another on the fly. You can also tell the program to copy files stored in subdirectories while it is copying a directory, and this feature is really handy — tell it to place the files in the new directory in alphabetical order while it is being created.

You can also tell *Dircopy* to automatically rewrite any file in the destination directory with the same name as a file in the source directory. However, if you don't feel safe with this approach, have *Dircopy* ask you each time it discovers this problem.

Ask 100 people how they organize their hard disk and you'll get 100 different answers. But there are some basics you should consider. To get in the mood, study these approaches from two members of the OS-9 SIG.

```
1.  /H0/LANGUAGES/BASIC09
     /SOURCE/INVENTORY/PROGRAMS
2.  /H0/INVENTORY/PROGRAMS
     /SOURCE/BASIC09
```

What is more important — the job or the program that runs the program that does the job? The first example emphasizes the computer instead of the job. The latter takes the opposite approach. I really can't say it any better than Kevin Darling who is one of the most active and knowledgeable individuals on the OS-9 SIG.

"The fact that a file is 'inventory related' is much more important to me than the language," he said. In other words, some nouns are more important to me than their adjectives."

Darling also posed a very relevant question. "Could someone other than you find things quickly when everything is stored relative to the language it is written in? I would hate to go looking all over my different language subdirectories, just to find one of my inventory programs."

Other good ideas came from Pete Lyall

and Jonathan Cluts who help SysOp Wayne Day manage the SIG. "I think we need to standardize and use a number of common directories like the UNIX crowd," Lyall said. "If we do this, then program authors can make certain assumptions about directories in this set."

Lyall's proposed directory set includes cmds, defs, etc, help, lib, src, sys, tmp and user. We are already familiar with cmds, defs and sys; they come predefined with OS-9. The purpose of the help directory is obvious, as is src. User would be used for all logins and would contain subdirectories for individual users. Etc would be a directory where you could store OS-9 procedure files. Library files obviously would be stored in the lib directory. This might also be a good place to put dictionaries and other common files. And finally, tmp would be used to store temporary work files.

> *"It is also now possible to give the utilities an optional command line argument list rather than use standard input."*

Cluts' idea has to do with starting the system. "I run *tsmon* at startup so I always log in. By logging in as different users, I can restrict myself to certain directories on the hard disk. This means I can only accidentally destroy some of my files. If I stay in the root directory I could destroy them all," he said.

On the same evening Cornelius Seon, who frequents RAINBOW's CoCo SIG on Delphi added the most relevant comment about his new Tandy hard disk. "Several packages which were only marginally useful on floppies are just wonderful now," he said. I agree.

But before closing, he left everyone with a problem. "There is a problem with Mother Tandy's Godfrey Daniels' helpfulness," he said. "I'm finding many programs they either wrote or commissioned looking for data on floppy drive /d0 after I've already transferred everything to /h0 using identical directory names."

Maybe we can help here. The problem probably isn't Tandy's at all. It relates more to the fast pace at which hardware technology is racing past the software. When most of the guilty programs were written, hard disks didn't even exist. If early software designers had made one change, programs would have moved right over from /d0 to /h0 automatically. We print that change here so anyone developing software now can avoid our earlier mistake.

Most of the programs causing a problem contain a pathlist to a device and directory. *DeskMate* is a good example. *DynaSpell* is another. For example, when *DynaSpell* needs the dictionary, it looks for /d0/spell/dictionary.dat. The future solution is for the programmers to take advantage of OS-9's anonymous filenames. In other words, instead of coding a pathlist named "/d0/spell/common.dat," I should have made that pathlist read, ". . ./spell/common.dat."

The first period tells OS-9 to look for the file in the current data directory, two periods means look at the parent directory of the current data directory and three periods means look in the parent of the parent of the current data directory. Is that the grandparent directory? By including five or six of these periods, I could have forced OS-9 to look clear back in the root directory. Then it wouldn't have mattered whether I had the file stored on /d0 or /h0, because it would be anonymous. I guess we all learn sometime — better late than never!

The fix for programs already written is to change the 'D' in the offending pathlists to an 'H' or to change the "/d0" to ". . ." Sounds easy enough, but how do you go about it?

There are several approaches. First, in many of the programs the strings defining the pathlist are located early in the program and you can locate them easily with the OS-9 dump utility. For example if you need to find these strings in *DynaSpell*, you would type:

```
OS9: dump spell
```

In the first page of the Hex dump you will see the strings and can jot down the number of bytes that each 'D' is offset from the beginning of the module. After you do this, load the program:

```
OS9: load spell
```

Then, call up the OS-9 *Debug* utility and link to spell.

```
OS9: debug
db: l spell
```

Now, move the *Debug* pointer to the first 'D' and use the '=' command to change it to an 'H'. After you change all the /d0s to /h0s and quit *Debug* with its Q command, you can save the file into a tempory file.

```
OS9: save tempspell spell
```

You're almost home free now. Rename or delete the original spell file and run this command.

```
OS9: verify <tempspell>spell u
```

Don't forget the 'u', it tells the OS-9 verify utility command to update the CRC of the module in the file you are verifying. After you have done this you can load or run the new *spell* file. Even though we used the *DynaSpell* program as an example here, keep in mind this same technique can be used with any program you need to modify for operation with a hard disk.

If you purchased Computerware's *Disk Fix and Utilities*, you will find it much easier to use the *Patch* utility from that package. For example, to make this change you first type:

```
OS9: patch spell
```

Then uses *Patch's* 'D' — for display — command to find the strings defining the bothersome pathlists.

```
>D 0000
```

Again, jot down the location of the offending 'D' and type:

```
>M 00XX
```

The XX would be replaced by the offset that you jotted down above. At this point when you see patch display the 'D' (as 44, by the way) you can type:

```
>'H
>/
```

Go through this sequence for each of the pathlists that contain /d0. Then, type:

```
>V
```

The V command tells *Patch* to validate the crc of the file you have patched and correct it. After you have done this, you can exit *Patch* with its Q command.

Sometimes the strings containing the floppy based pathlists aren't stored in the first page. In this case *Patch* is really a help because it gives you a find command. After starting *Patch* you can type:

```
>F'DO
```

After you press the ENTER key, *Patch* prints a list of every occurrence of that string in the program you are adapting to the hard disk. After you have the list of addresses, you must use the M command again to change the 'D' to an 'H' in each case. One note of caution. Take a close look at each 'd0' you find and make sure that it is, in fact, part of an actual pathlist. It could just be a natural occurrence in the program's code itself.

Dan Johnson Markets Enhanced Package

SDisk author Dan Johnson (7655 SW Cedarcrest St., Portland, OR 97223, 503-244-8152) has upgraded all of his OS-9 filter and hacker's kits and placed them in one package called the *LI Utility Pak*. Don't let the name fool you; all but three of the programs in this package run on both Level I and Level II OS-9 systems. These three deal with absolute memory manipulations.

Johnson hopes to release a supplement Level II utility package sometime later. I bet he'll have an incentive when Tandy's new Color Computer hits the market. He has also added several new programs to the package including *Modbuster, Afmt, Upall, Grep* and *Sectedit*.

Dan has made major improvements to the template matching algorithm in his new *ls* command and most of the utilities now accept options at the beginning or end of a command line. It is also now possible to give the utilities an optional command line argument list rather than use standard input. The *MacGen* program has been expanded and Johnson gives the *MacGen* source for a useful program, *UpAll*. The package sells for $49.95 and is shipped on a CoCo formatted OS-9 disk. However, you can buy the package in other formats by paying an additional $2. Johnson calls it a deal as good as *Turbo* PASCAL on MS-DOS.

Two More Goldberg Tips

Earlier this year, Steve Goldberg discovered that the modification date was changed every time he changed directories while using OS-9 Version 2.00.00. To solve the problem, he uses the following procedure file on the shell module and builds a new boot file with the patched shell.

```
debug
l <SPACEBAR> shell
. <SPACEBAR> .+269
=81
. <SPACEBAR> .+28D
=E9
=49
=67
q
cobbler /d0
```

Goldberg noted that since he has run this procedure his directory changes are faster and the drives don't grind while attempting to write the date to a write protected disk when he changes directories.

I thought we published the changes to CCDisk which let you step your disk drives at a faster rate earlier this year. But I couldn't find them, and we have been seeing a lot of traffic on the Delphi CoCo SIG and getting a few requests in the mail, so we'll give it another try. This time, thanks to Steve Goldberg's homework, we'll compare them to the identical changes you had to make with OS-9 Version 1.00 and 1.01. The new values change the step rate of your drives to six milliseconds. See *The Complete Rainbow Guide to OS-9* for the value for other step rates.

CCDISK OFFSETS

Version 1.0	Version 2.0	New Value
$1FE	$1F9	$10
$204	$1FF	$08
$205	$200	$8B
$2DD	$2DD	$40
$2E9	$2E8	$00

Goldberg is brave and pushed the value of the word at $1FF down to $0001. I don't think I would push it that far. He also cut the drive startup delay since his drives seemed to be fast. To do this he changed the $A0 at an offset of $2F9 to $0A.

BASIC09 Beginners Notes

Henry J. Proffitt of Haley Station, Ontario wrote to ask how he could enter a short BASIC09 program he had stored in a standard OS-9 text file into BASIC09. Proffitt entered the program with the *Build* utility, but you could use any OS-9 editor including *TSEdit* or the *DeskMate* editor to enter a BASIC09 program.

The thing you must remember is that BASIC09 expects to see the word "procedure" as the first thing in a file it is trying to load. Therefore, if you type the line `procedure myprogram` as the first line in your file, BASIC09 will be able to load it. Incidentally, the 'p' in procedure must be the very first character in the file.

After you have created the text file following the directions above, you can load it from the BASIC09 system mode — you'll know you are there because BASIC09 prompts with "B:". Just type:

```
B: load myprogram
```

BASIC09 assumes there is a file named "myprogram" stored in your current data directory and that the file contains a BASIC09 procedure. If you have not saved your program there, use the CHD command from within BASIC09 to set the current data directory or type a complete pathlist:

```
B: load /D1/MYDIRECTORY/
  MYPROGRAM
```

We received a note from Robert Gault of Grosse Pointe Woods, Michigan about a solution to another BASIC09 programming problem you may have noticed while working with BASIC09. How do you send a character with the value $FF to the screen or printer? This is a problem that must be solved if you plan on sending graphics to the printer.

There are two solutions. You can use the BASIC09 shell command and use OS-9 to send out the character or you can use a PUT statement instead of a PRINT statement.

```
SHELL "display FF"
SHELL "display FF >/p"
PUT #PRINTER, $FF
```

Gault submitted a demonstation procedure and a rough and ready screen dump program to illustrate his techniques.

Next Month

Next month we'll dig back in the mailbox and see what's been bothering you the most. Hopefully, we can come up with a tip or two. And, we'll cross our fingers and hope we get to play with a new OS-9 Level II Color Computer soon! 'Til then, keep on hacking! ☐

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Listing 1: ***strings***

```
PROCEDURE strings
DIM ss:STRING[256]
DIM i,memory:INTEGER

memory:=ADDR(ss)

(* Now fill memory with $FF's *)
FOR i=memory TO memory+255
POKE i,255
NEXT i

(* Note that BASIC09 thinks ss is an empty string *)

PRINT "The length of string ss ="; LEN(ss)
PRINT "ss =("; ss; ")"
PRINT "Now we will PUT ss.  Note the difference!"
PUT #1,ss
(* Use these lines to send ss to a printer, then *)
(* OPEN #printer, "/p" *)
```

Listing 2: ***printer***

```
PROCEDURE printer
(* This procedure is a rough and ready graphics screen dump *)
(* It assumes a preceding graphics program has used         *)
(* GFX("mode",format,color)                                 *)
(* If your printer uses an eight pin graphics format change *)
(* the "pin" loop to 0 to 7.                                *(

DIM dev:BYTE
DIM color,x,y,pin,send,location:INTEGER
DIM code:BYTE

OPEN #dev,"/p":WRITE
(* Now set printer to graphics mode *)
PRINT #dev,CHR$(18)
location:=ADDR(code)

FOR y=191 TO 7 STEP -7
FOR x=0 TO 255

(* tell printer code is graphics *)

send:=128

FOR pin=0 TO 6
(* Test Pixel *)
RUN gfx("gcolr",x,y-pin,color)
(* Printer used has top pin 2^0 bottom pin 2^6  *)
send:=LOR(send,MOD(color,2)*2**pin)
NEXT pin
POKE location+x,send
NEXT x
PUT #dev,code
(* Send carriage return *)
PRINT #dev,CHR$($0D)
NEXT y
```

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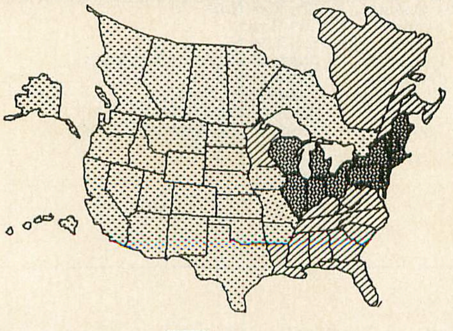

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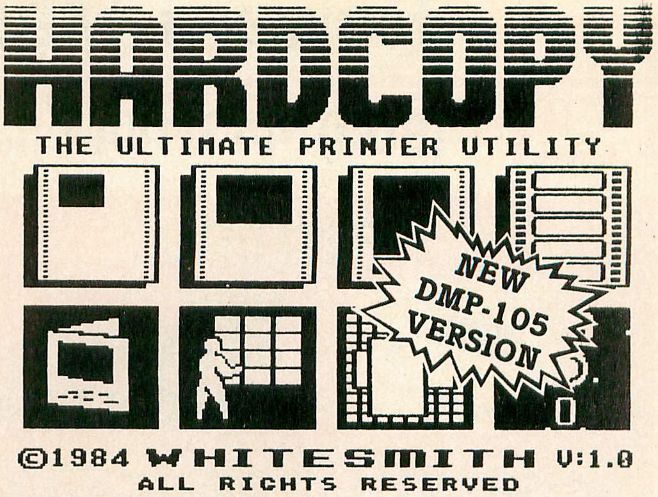
- **GREETING CARDS** - The greeting card option allows the user to custom design greeting cards using both text and graphics.
- **GIANT POSTERS** - The poster option provides the user with a means of reproducing a hi-res graphic to a multi-sheet poster.
- **SPECIAL EFFECTS** - The special effects option allows the user to directly control the printing directives; ROTATION, X/Y SIZE, X/Y FLIP, X/Y GRID, X/Y FILL, TAB, WINDOW, POS/NEG IMAGE, and more!
- **USER CALL** - Have an application that **HARDCOPY** doesn't quite match? **HARDCOPY** routines can be added to EXTENDED BASIC through the USR command!

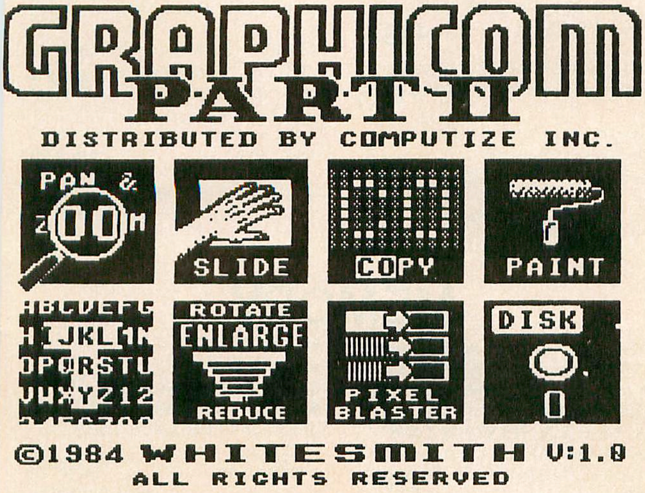
HARDCOPY* requires a 64K Color Computer or Color Computer II, and at least one disk drive. It supports 1 to 4 disk drives, keyboard or joystick input. Please specify **printer** and **cat. number** when ordering.

IDS 480/560-G	Cat. No. 170WD	Gemini 10X	Cat. No. 174WD
Oki 82A (Okigraph)	Cat. No. 179WD	Gemini SG-10/15	Cat. No. 178WD
Okidata 92	Cat. No. 171WD	DMP-105	Cat. No. 183WD
Epson LX-80	Cat. No. 173WD	DMP-110	Cat. No. 180WD
Epson MX-80	Cat. No. 172WD	DMP-120	Cat. No. 176WD
Epson RX-80	Cat. No. 173WD	DMP-130	Cat. No. 180WD
Epson FX-80	Cat. No. 173WD	DMP-200	Cat. No. 175WD
Riteman PLUS	Cat. No. 177WD	CGP-220	Cat. No. 181WD

* Due to hardware differences, some features may function differently on certain printers.



HARDCOPY PRINT UTILITY $29.95



GRAPHICOM PART II $24.95

YOU COULD SPEND $100.00 OR MORE TO UPGRADE YOUR GRAPHICS SYSTEM, JUST BUY...

Eclipse (Zoom)	$19.95/Moreton Bay
Super Paint (Paint)	$19.95/Michtron
Shrinx (Reducer)	$21.95/Grafx
Text Master (Hi-Res Text)	$29.95/Data Man
G.C.U. (Disk Utilities)	$19.95 Computize

OR YOU COULD SPEND $24.95 FOR GRAPHICOM PART II AND GET:

a video processing package that provides many functions that are missing in Graphicom. Here are just a few of the features provided by Graphicom Part II:

ENLARGE/REDUCE/ROTATE
Enlarge or reduce any portion of a graphic screen, just like a photographic enlarger! Rotate by any degree or fraction of a degree around any point on the screen.

PAINT
Paint or "fill-in" any irregular area on the screen! More than 50 different colored patterns available. Additional paint patterns may be user-defined.

PAN & ZOOM
"Zoom in" x2, x4, or x8 on any portion of the screen to do fine pixel work. Allows editing of Graphicom character sets with ease!

TYPESETTER & FONT EDITOR
Add text in 16 different sizes, also supports user definable foreground & background colors. Design & Edit characters for use in the typesetter.

PIXEL BLASTER
Allows the user to easily substitute or remove colors. Widen lines, swap BLUE & RED without effecting BLACK & WHITE, etc.

GRAPHICOM PART II DOES NOT REQUIRE GRAPHICOM TO RUN!

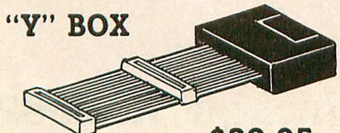
Graphicom Part II requires a 64K extended disk basic system, and supports 1 to 4 disk drives, keyboard or joystick (analog or switch type) input. It will load and save both **Standard BIN** files and **Graphicom** screens. All functions support color or Hi-Res operation, as well as the 4 screen display modes.

NEW LOW PRICE! GRAPHICOM DIGITIZER $159.00

Input directly into Graphicom for easy enhancements, manipulation, stamping, and storage. Accepts composite video signal in (1.0v p-p) from video camera, VCR, video disc player, another computer, or other compatible video sources. View "off air" or "VCR" digitized video at close to real-time. "Snapshot" video frames to the digitizer's internal memory. No slow, data serial manipulation.
Use with your multi-pak, "Y" box, or a "Y" cable ("Y" cable available at $19.95)
Video is input via a "BNC" connector.
External controls for HORIZONTAL POSITION, VERTICAL POSITION, HORIZONTAL WIDTH, BRIGHTNESS, and CONTRAST (FUZZ) settings.
Don't be fooled by imitations...this is the GRAPHICOM VIDEO DIGITIZER . . . the **only** digitizer that "DIRECTLY" inputs into Graphicom

REQUIRES 64K COCO, 1 DISK DRIVE, AND 2 ANALOG JOYSTICKS. FREE GRAPHICOM PROGRAM, PICTURE DISK, AND GRAPHICOM UTILITY SUPPLIED WITH PURCHASE OF VIDEO DIGITIZER (A $50 VALUE).

"Y" BOX



$29.95

GRAPHICOM $24.95

Catalog No. 111GD
Simply stated - One of the finest graphic programs written for the Color Computer!
FEATURES:
- S-U-P-E-R U-S-E-R F-R-I-E-N-D-L-Y !
- Supports 4 Hi-Res display modes
- 4 page animation mode
- Color Palette with over 15 color patterns for use with Hi-Res artifact
- Send/Receive pictures over modem
- Supplied utility allows capturing Hi-Res screens from most COCO arcade games
- Multiple Hi-Res character fonts (user redefinable)
- Supplied utility for transferring Graphicom screens to Basic or other M/L programs.
- Supplied utility for loading screens from Basic or other sources
- Built in Hi-Res SCREEN PRINT (compatible with EPSON, C-ITOH, GEMINI-10, OKI, plus Radio Shack's LP-VII, LP-VIII, DMP-100, DMP-200, and GCP-115 printers) from 110 to 9600 baud
- SEND/RECEIVE slow-scan television
- Many additional features, operating hints, hardware mod's and suggestions, etc.

REQUIRES 64K COCO, 1 DISK DRIVE, AND 2 ANALOG JOYSTICKS

NEW MASTER KEY II

New Improved Version! A hardware product that takes control of any program regardless of protection. Now use with RS Multi-pak, "Y" cable or **optional** extender cable. Captures register contants as they were when Master Key II was engaged. Complete disassembler, memory save, and much more. Requires some familiarity with Assembly Language.

ROM PAK Cat. No. 160HR .... $ 99.95
Cat. No. 161HR With Ext. Cable . . . $109.95

PICTURE DISK SETS

Available from COMPUTIZE
4C - Artifact color palette
5C - Large character sets (from Derringer Software)
6C - Same as 5C but set up as stamp set
Picture Disk Set 1 .... $19.95
7 - Miscellaneous Art Set #1
8 - Miscellaneous Art Set #2
9 - Miscellaneous Ads and Examples
Picture Disk Set 2 .... $19.95
10 - Miscellaneous Fonts
11C - Artifact color palette type fonts
Picture Disk Set 3 .... $14.95
12C - Art demo from WHITESMITH
13C - GRAPHICOM PART II function demo
Picture Disk Set 4 .... $14.95

GC II FONT DISKS

Each disk contains 10 or more fonts. (4 versions of each font, one for each display mode).
14C - GCII Fonts Disk #1
15C - GCII Fonts Disk #2
16C - GCII Fonts Disk #3
GRAPHICOM PART II Font Disks . . . $19.95

TRIPLE TRANSFER UTILITY ©

Transfer contents of disk to tape • Transfer contents of tape to disk • Automatically relocates cassette programs that conflict with the disk operating system • Displays machine language program addresses • Copies ASCII, Basic, & Machine Language Programs • All contained in 1 menu driven program!

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Cassette $19.95 . . Cat. No. 105CT
Disk $24.95 . . . . Cat. No. 105CD

SUPER BACK-UP UTILITY ©

. . . WITH S.B.U. FROM COMPUTIZE — YOU'LL NEVER NEED ANOTHER BACK-UP UTILITY FOR YOUR COCO!!!
SUPER BACK-UP UTILITY WILL PERFORM **ALL** OF THE FOLLOWING FUNCTIONS:

1. **TAPE TO TAPE** (Regardless of most protection schemes!)
2. **TAPE TO DISK** (Move Cassette programs to Disk!)
3. **AUTO RELOCATE** (For those Cassette programs that conflict with Disk operating systems.)
4. **DISK TO TAPE** (Place Disk programs onto Cassette)
5. **DISK TO DISK** (Our powerful Split-N-Image Program, Copies regardless of most protection schemes!)

- **MENU DRIVEN**
- **REQUIRES 32K EXTENDED COCO**
- **REQUIRES 1 OR 2 DRIVES**
- **ALL MACHINE LANGUAGE!!!**

COMPARE WITH OTHER INDIVIDUAL PROGRAMS COSTING IN EXCESS OF $100.00
DISK $49.95 . . . . Cat. No. 107CD

SPIT-N-IMAGE ©

M/L Disk Back-Up Utility

There is no need to suffer the heartbreak of crashed disks any longer. Spit-N-Image will create a mirror image of your valuable disk programs which do not respond to normal back-up functions. Will also initialize and back-up in one pass. Data processing experts always insist on having a back-up — it's good a practice.

REQUIRES 32K CC
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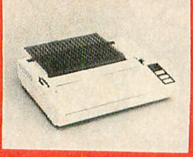
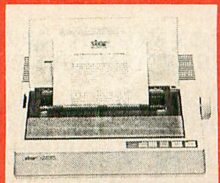
PRINTERS



NEW Dual Mode EPSON LX-80

The LX-80 offers draft or near letter quality plus a 1K input buffer for much faster graphics printing speed. LX-P package includes the LX-80, a Botek serial to parallel converter, and a Howard Printer Tutorial.

$317 **($7 shipping)** **Add $29.50 for tractor ET-1**

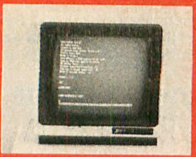


STAR NX-10

The NX-10 is the latest generation of printers and offers built-in back tractor feed giving forward and backward movement of paper plus exceptional graphics printing capabilities. NX-P package includes the NX-10, a Botek serial to parallel converter and the Howard Printer Tutorial. **$307** **($7 shipping)**

MONITORS

ZENITH 123A 12″



This 12″ green screen high resolution monitor offers 80 column capability, Zenith quality and a 30 day warranty valid at any of Zenith's 1200 locations.

Retail $149 **Our price** **$67.50** **($7 shipping)**

122A Zenith 12″ Amber Screen offers the same 640 dots × 200 dots resolution at 15MHz as the 123A and a 90 day warranty valid at our 1200 locations. **($7 shipping)** **$88**

Closeout Specials — only 14 in stock. We have a limited number of lesser known color monitors that have been discontinued but are brand new in their original boxes. **$149** **($14 shipping)**

141 Roland 13″ Color Monitor with speaker, 270 dots × 200 dots resolution, 4 MHz band width. **$217** **($14 shipping)**

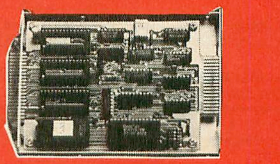
131 Zenith 13″ Color Monitor has medium resolution with speaker and RGB jack. **($14 shipping)** **$168**

All monitors require an amplifier circuit to drive the monitor and are mounted inside the color computer. They attach with spring connectors, with two wires extending out of the computer, one for audio and one for video.

VA-1 for monochrome monitors only, fits all color computers **($2 shpg)** **$24.45**

VC-4 for monochrome or color, fits all color computers **($2 shpg)** **$39.45**

DISK CONTROLLERS



DISTO DC-3

Includes controller and DOS ROM Chip.

$98 **($2 shipping)**

ADD-ON BOARDS

DC-38 includes 80 column capacity, parallel printer, real time clock, and all software **$138**

DC-256 256K RAM Board includes software to access all RAM **$125**

DC-3P Mini Epson Programmer includes all software to program 2764 or 27128 **$55**

DC512 512K RAM Board **$165**

RS-1 Radio Shack's 1-1 ROM based operating system **$20**

DD-2 Double sided 360K disk drive with ½ heightcase and power supply **$188**

CA-1 Cable to connect controller to one drive **$24.50**

CA-2 Two drive cable **$29.50**

MEMORY

64-E1 for E Boards with complete instructions. Remove old chips and replace with preassembled package—no soldering or trace cuts. **($2 shpg)** **$24.85**

64-F1 for F Boards. No soldering needed. Capacitor leads must be cut. **$24.45** **($2 shipping)**

64-2 for COCO 2. Kit requires one solder point, no trace cuts. **($2 shipping)** **$24.45**

64-22 Two chip set for 26-3134A and B, 26-3136A and B. Koren Color Computers require 1 solder point **$28.45** **($2 shipping)**

SOFTWARE SPECIALS

PAYROL/BAS™

Written in nonprotected basic for the color computer. This easy-to-use package of programs will simplify and decrease the time spent doing payroll. *Rainbow* May 1986 review says, "Elegant and professional." State and federal tables are already included. Send $1 for 11 page reports guide. **$79.95**

VIP LIBRARY

Softlaw's integrated package includes VIP writer terminal, data base, call and disk zap which can fix a diskette that is giving I/O errors. **$125**

SAP-II

Stock analysis program organizes your portfolio and gives specific sell and stop-loss points. **$19.95**

BPA-1

Chart your blood pressure from daily readings taken in the comfort of your home. **$19.95**

GUARANTEE

Howard Medical's 30-day guarantee is meant to eliminate the uncertainty of dealing with a company through the mail. Once you receive our hardware, try it out; test it for compatability. If you're not happy with it for any reason, return it in 30 days and we'll give you your money back, (less shipping).

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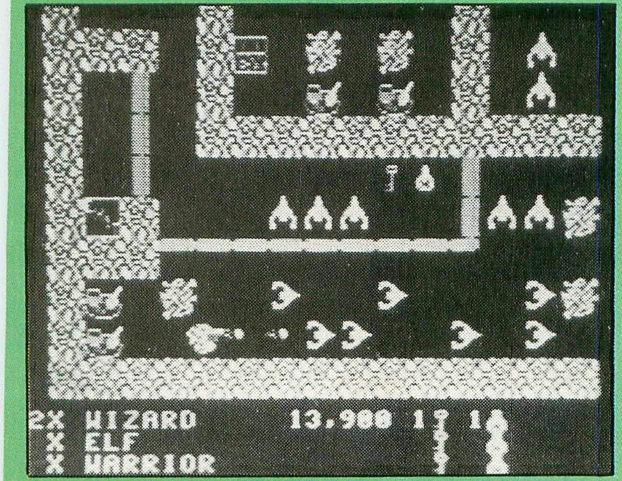
GANTELET

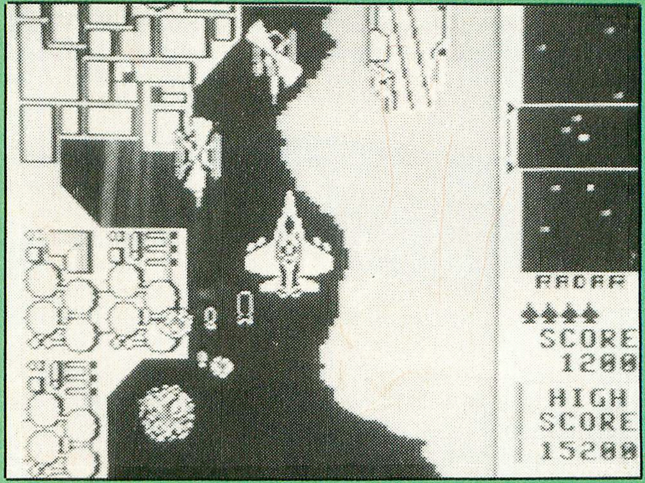


One, two or even three people can play Gantelet at the same time. You and your friends travel through the many levels in search of an exit to the next level. Avoid the Ghosts and other creatures that are out to stop you in your quest. Collect keys to open doors, treasures and magic potions to aid you in your battle. Watch out for hidden traps as you frantically search for the exit to the next level.

64 k required
tape or disk

$28.95 U.S.
$38.95 Can.

Mission: F-16 ASSAULT

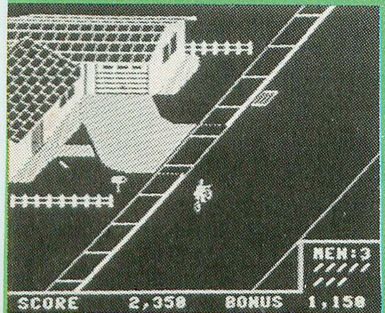


Fly your plane over land and water while avoiding enemy missiles, planes and helicopters attacking from the top and bottom of the screen. Use your radar to track objects as they approach the main screen. Bomb oil refineries, airports and destroy planes before they can take off from the airports. Watch out for missiles fired from hidden missile silos on the ground. Dozens of screens of detailed terrain plus increasing difficulty make this a great game for everyone.

64 k and joystick required
tape or disk

$28.95 U.S.
$38.95 Can.

PAPER ROUTE

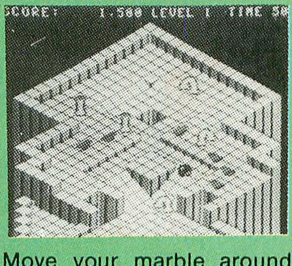


As a paper boy, you ride your bike along your route delivering papers to your customers. Break customers' windows or damage their property and they will cancel their subscriptions! Earn bonus points by damaging non-subscribers' property. Avoid pedestrians, cars, and maybe even a mad dog in your attempt to deliver all of your papers! Detailed graphics and lots of surprises make this game a real challenge for everyone.

64 k
joystick required
tape or disk

$28.95 U.S.
$38.95 Can.

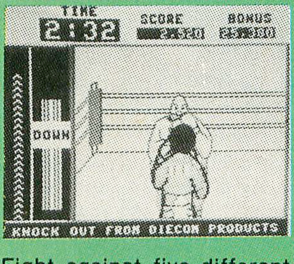
MARBLE MAZE



Move your marble around the mazes in your search for the finish line! Avoid marble eaters, acid puddles and other creatures that inhabit the mazes. Eight different levels and great graphics make this game a must for your collection.

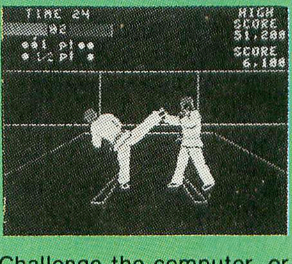
joystick required

KNOCK OUT



Fight against five different boxers in this great boxing game! At first the boxers are easy to knock out, but beware, it gets harder as you move on. The boxers are out to stop you in your quest to become champion of the world. Outstanding graphics make this a must for your collection!

KARATE



Challenge the computer, or a friend to a Karate match! Use various Karate punches and kicks to knock your opponent down and earn points to win the match. When challenging the computer, your opponent's Karate skills increase as you win matches. This game is a challenge for even the expert game player.

joystick required

64 k required tape or disk $28.95 U.S. $38.95 Can.

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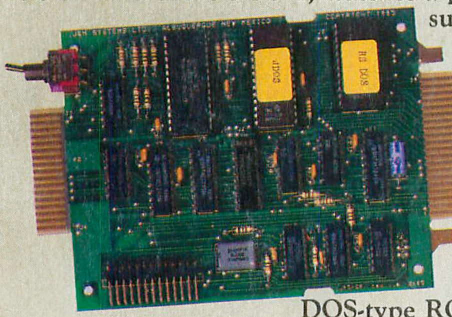
HEAT UP YOUR COCO!

New HARD DRIVES

Besides the obvious advantage of increased disk access speeds and a vast amount of storage, our COCO hard drives boast many innovative features. For instance, you may boot OS/9 directly from JDOS - no intermediate boot floppy is required. Our software can run with virtually any winchester with a ST412 type interface. Our drives have capacities of 5, 10, or 20 MBytes (formatted), and may be either partitioned into up to 7 logical units or left as one large logical unit. Our COCO hard drive systems are complete with case, power supply, cables, OS/9 drivers, and instructions. Prerequisite: OS/9, JFD-CP controller.

5¼" 5 MByte full size	$495
5¼" 10 MByte ½ size	$650
3½" 20 MByte (shown above)	$795

JFD-CP DISK CONTROLLER



Our new JFD-CP, compatible with both the original COCO and the COCO 2, features a parallel port to support a Centronics compatible printer or our hard drive, and an external ROM switch, which allows you to select JDOS or an optional RS DOS-type ROM. It comes in a case and includes JDOS 1.2 and manual. JDOS implements all RS DOS commands, plus many more, including auto line numbering, error trapping, baud rate selection, OS/9* boot from floppy or hard drive, and Memory Minder**, our disk drive analysis program (Precision Alignment Disk not included).

JFD-CP Disk Controller with JDOS	$139

COCO-CLASSIC

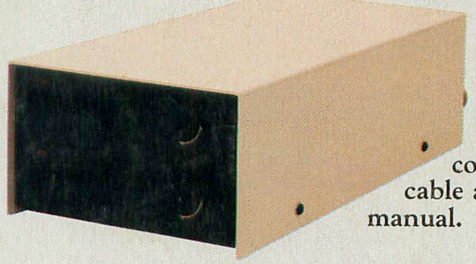
Our old JFD-COCO controller remains a strong seller. Some people just like old "classics" best! So we have brought it back at the lowest price ever!

JFD-COCO Disk Controller with JDOS	$99

New TERMS

One-year warranty on parts & labor; 30-day money back guarantee (except shipping) if not totally satisfied. Items must be returned in like new condition.
Free shipping via UPS in continental United States for payment by VISA, MasterCard, or cashiers check. COD requires 10% prepayment by bank card plus 3% shipping. Blue Label and foreign shipping extra.

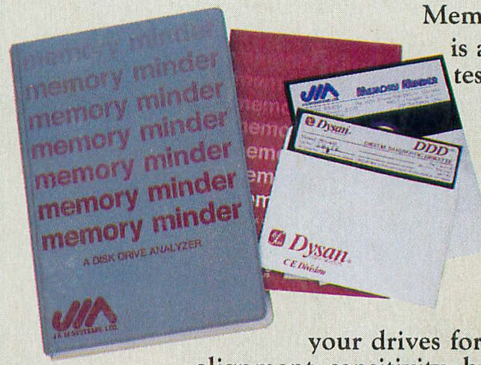
DRIVE SYSTEMS



Upgrade your Color Computer by adding our new JFD-CP disk controller, supercharged with JDOS 1.2 operating system, and a top quality drive with case and power supply. Comes complete with cable and JDOS manual.

Drive 0 System with one single side drive	$279
Drive 0 System with one double side drive	$349
Drive 0,1 System with two single side drives	$389
Drive 0,1 System with two double side drives	$489

MEMORY MINDER**



Memory Minder is a disk drive test program now included in JDOS. Used with a Precision Alignment Disk, Memory Minder allows you to check your drives for speed, alignment, sensitivity, hysteresis, and more! You can actually align or adjust the drives while viewing the graphics on the screen. No special equipment needed!

PRECISION ALIGNMENT DISKS (From Dysan)	
PAD-40X1: Tests single side disk drives	$26
PAD-40X2: Tests double/single disk drives	$33

Memory Minder is available on diskette for those who don't own a JFD-CP controller with JDOS. Includes Precision Alignment disk.

Memory Minder: single side package	$59
Memory Minder: single/double side package	$75

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*OS/9 is a registered trademark of Microware, Inc.
**Memory Minder is a registered trademard of J&M Systems, Ltd.

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